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THE LONDON NATURALIST

ournal of the
LONDON NATURAL HISTORY SOCIETY

No. 74 1995

LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32-km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises Sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology, or rambling, there is a Section ready to help.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The *London Bird Report*, also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin*, are sent to members throughout the year.

Indoor meetings

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

Field meetings

Led by experts to visit interesting natural localities, both within and outside our Area. These excursions are very popular with beginners wishing to increase their knowledge, and enable members to get to know one another.

Library

A large selection of books and books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

Reading circles

Many important natural history journals are circulated by the Sections at a fraction of the cost of subscribing direct.

SUBSCRIPTIONS

ORDINARY MEMBERS	£10.00
JUNIOR MEMBERS	£5.00
SENIOR MEMBERS	£5.00
FAMILY MEMBERS	£2.00
CORPORATE SUBSCRIBERS	£10.00

Junior membership is for persons under 18, or under 25 and receiving full-time education, and senior membership is for persons over 65 who have been continuous members of the Society for ten complete years. All except family members receive one free copy of *The London Naturalist* and the *London Bird Report* each year. Cheques and postal orders, payable to the London Natural History Society, should be sent to:

The Membership Secretary, LNHS, P. C. Holland,
Flat 9, Pinewood Court, 23 Clarence Avenue,
London, SW4 8LB

THE LONDON NATURALIST

Back numbers of *The London Naturalist* and the *London Bird Report,* may be obtained from the Publications Sales Secretary, Mrs V. M. Friedman, 5 Temple Close, Cassiobury, Watford, Hertfordshire WD1 3DR. Reprints of the *Annual rainfall overlay, Master grid overlay, Habitat overlay, Regolith overlay, Air pollution overlay* and *Recording areas overlay* are free on receipt of a stamped addressed envelope.

Top. The Brent Reservoir, or Welsh Harp, Middlesex.
Bottom. Common reed *Phragmites australis* bed at the Brent Reservoir.
The London Naturalist, No. 74, 1995. *Photos: L. R. Williams*

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THE
LONDON
NATURALIST

Journal of the
LONDON NATURAL HISTORY SOCIETY

No. 74

for the year 1994

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LONDON NATURAL HISTORY SOCIETY

Founded 1858

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7 Croft Gardens, Ruislip, Middlesex HA4 8EY

Honorary Vice-Presidents

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Secretary: A. J. Barrett, 21 Green Way, Frinton-on-Sea, Essex CO13 9AL.

Treasurer: M. J. West, 52 Trinity Road, Ware, Hertfordshire SG12 7DD.

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Editor, *London Bird Report*: M. A. Hardwick, The Garden Flat, 13 Southcote Road, London N19 5BJ.

Editor, *Newsletter*: M. Thain, MA, B.SC., Upper Cairnryan, Harrow Park, Harrow, Middlesex HA1 3JE.

Editor, *Ornithological Bulletin*: D.J. Montier, Eyebrook, Oldfield Road, Bickley, Bromley, Kent BR1 2LF.

Elected Members of Council: J. F. P. Bennett, M. J. Earp, Dr J. Hewlett, Mrs P. R. Robbins, B.ED., Miss J. Shane, M.SC., J. M.W. Topp,

Representative Members of Council: Botany—Dr M. C. Sheahan; Ecology and Entomology—J. A. Thompson; Ornithology—P. W. Bradbeer; Ramblers, Archaeology and Geology—Miss D. E. Woods; South-West Middlesex—R. G. Bowden.

The Society's recorders

Botany

Flowering plants and vascular cryptogams:
R. M. Burton, MA, FLS,
Sparepenny Cottage,
Sparepenny Lane,
Eynsford. Kent DA4 0JJ 01322 863216

Bryophytes:
Dr K. J. Adams,
63 Wroths Path,
Baldwins Hill
Loughton, Essex IG10 1SH

Ecology and Entomology

Mammals:
C. Herbert,
67A Ridgeway Avenue,
East Barnet,
Hertfordshire EN4 8TL

Reptiles and amphibians:
T. Langton, B.SC.,
12 Millfield Lane,
London N6 6RA
01986 784518

Mollusca:
F. C. Naggs,
c/o Department of Zoology,
The Natural History Museum,
London SW7 5BD

Dragonflies:
S. J. Brooks,
35 Salisbury Avenue,
St Albans,
Hertfordshire AL1 4UB 01727 863532

Fishes:
Vacant

Butterflies, moths, invertebrates not listed elsewhere:
C. W. Plant, B.SC., FRES,
14 West Road,
Bishop's Stortford,
Hertfordshire CM23 3QP
01279 507697

Spiders and other arachnids:
J. E. D. Milner,
80 Weston Park,
London N8 9TB
0181-341 2158

Orthoptera:
D. S. Martin,
121 Devonshire Road,
Hornchurch,
Essex RM12 4LP

Heteroptera:
E. W. Groves,
143 Westleigh Avenue,
Coulsdon,
Surrey CR5 3AF

Ornithology

Buckinghamshire:
A. V. Moon,
Chalk Dell House,
London Road,
Rickmansworth,
Hertfordshire WD3 1JP

Kent and Lower Thames (London Bridge to Tilbury):
A. J. Morris,
134 Station Road,
Crayford,
Kent DA1 3QQ

Essex:
M. K. Dennis,
173 Collier Row Lane,
Romford,
Essex RM5 3ED

Inner London:
M.A. Hardwick,
The Garden Flat,
13 Southcote Road,
London N19 5BJ

Hertfordshire:
A. Wilson,
14 Marina Gardens,
Cheshunt,
Hertfordshire EN8 9QY

Surrey and Upper Thames: (Staines to Wandsworth)
S. J. Spooner,
32 Berkeley Drive,
West Molesey,
Surrey KT8 1RA

Middlesex:
C. Lamsdell,
4 Hardings Close,
Iver Heath,
Buckinghamshire SL0 0HL

Geology

Vacant

Records may be sent to the appropriate recorder (where shown) or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Requests for information should be made to the appropriate recorder.

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Report of the Society for 1994

Approved at the Annual General Meeting on 12 December 1994

It is with deep regret that we record the deaths of G. M. Abbot, C. B. Ashby, an honorary vice-president of the Society, Mrs S. Hall, Miss L. Hall, Miss M. H. Rhone, D. Thompson and J. F. Wyley.

The loss suffered by the Society as a result of Brad Ashby's death is incalculable — he was involved in so many projects and his wise counsel has already been sadly missed in many areas. A full obituary is published in *The London Naturalist* No.73. Council has been pleased to appoint Richard Fitter and Richard Butler as honorary vice-presidents. Both these fine naturalists have worked very hard for the Society over many years; as recently as 1993 Richard Butler was instrumental in setting up a Regionally Important Geological/ Geomorphological Sites Committee for London. The Council has also appointed as honorary members A. J. M. Bailey, Dr J. H. Harvey, to whom goes the Council's thanks for the gift of some valuable journals, Professor J. D. Gillett, Miss R. Davis, E. W. Groves, and Miss D. E. Woods.

Our continuing drive to increase membership has been slowed by the illness of our Publicity Secretary, David Harding; we hope that he and other officers who have had a difficult 1994 in terms of health will soon be returned to full fitness. Notwithstanding the above, our membership has grown to 1,248. A breakdown of the figures into categories during the past four years may be of interest to members:

For year ended 30 September	1991	1992	1993	1994
Ordinary	812	793	914	936
Family	97	92	121	121
Junior	13	4	8	15
Senior	123	124	134	129
Honorary	13	14	14	15
Life	8	8	8	7
Affiliated	15	13	22	25
Total	1,081	1,048	1,221	1,248

The Society again took a table at the Annual Exhibition of the Amateur Entomologists' Society. We continue to work with the wildlife trusts and similar bodies to enhance the future of natural history in our Area. Our Conservation Officer, David Bevan, has had a busy year. In March he attended the launch of the 'Watling Chase Forest Plan — draft for consultation' and submitted a response on behalf of the Society. In August, after widespread consultation with members, the Society was able to respond to the Corporation of London's Draft Management Plan for Hampstead Heath. In October the Lee Valley Regional Park Authority asked for our comments on the Draft Development Plan for the Nazeing Meads Area; the Society's new Mammal Recorder, Clive Herbert, was able to assist David in making a submission on this rich site for bats. The Society expressed concern over proposals from English Nature to denotify Stanmore Common as an SSSI — it is now expected that the site will be declared a statutory Local Nature Reserve.

A number of joint meetings have been organized with the London Wildlife Trust; these included a fungus foray in Haringey, which attracted some eighty participants, and a workshop on 'Monitoring for Nature Conservation'. The Society's thanks go to David and his helpers for all the work undertaken.

Most sections have had a successful year, but some are suffering from a shortage of officers. Council has therefore decided to link Geology with the Ramblers and Archaeology Section. It is particularly grateful to Richard Butler for reviving Geology meetings following Richard Goulding's resignation; the latter's efforts over many years are much appreciated.

(Members will recall that each section will now publish its own report on its activities in *The London Naturalist.*)

There has been much activity at Bookham Common although the death of Brad Ashby has meant that some rethinking of our work there has been necessary. Council has decided that the Bookham Common Survey should be treated as a section of the Society. We are grateful to Dr Menzies and his team for their work, which is progressing at a steady pace. It is encouraging that new workers are now supporting our long-established research programme. A fuller report on the new section's activities will be published in *The London Naturalist.* The Society made a grant of £1,000 to The National Trust towards the provision of improved facilities at Bookham.

With *The London Naturalist* No. 73 was issued the geology drift map prepared by Ken Hill and Colin Plant. The Society is grateful to them for the work which they put in to the project.

Sales of the Society's publications remain steady. It was not possible to market the made-up runs of journals in 1994 as planned, but it hoped that the project, which will be of benefit to some members and the Society as a whole, will begin in 1995. It is gratifying to think that some of our books were displayed at the recent World Book Fair in Dallas. In 1995 we should see the publication of *Bird-watching in London* by E. M. Nicholson. Max Nicholson, one of our honorary vice-presidents, has given this work on his observations in London parks in the 1920s to the Society. We feel both honoured and privileged to arrange for its publication. We extend to him our thanks and offer him our congratulations on achieving the great age of ninety. Work continues on the *New atlas of breeding birds*; publication is possible in autumn 1995, but no date can yet be finalized.

The Society has decided to sponsor our logo species — the house sparrow — for the European Breeding Bird Atlas project. It will be recalled that last year the Society awarded a grant to Nonsuch Watch. In *The London Naturalist* No. 73, recently issued, is a paper by Dr June Chatfield; this paper was produced as a direct result of awarding the grant and it is hoped that the paper will have been enjoyed and appreciated by members. The reputation of our journals continues to grow and they are to be found all over the world. The Society is grateful to the editors, Keith Hyatt and Mark Hardwick, for their continuing efforts over many years. In 1995 we will see completion of a review ordered by the Council into the methods of recording data. Council has already decided to support the computerization of ornithological record using the COBRA package.

Work on the Society's Library continues. During the year, the need of members for up-to-date information has been catered for by the addition of thirty-seven new items to the bookstock. The policy of offering surplus or unwanted materials to members at meetings has continued and sales this year realized £98. Joan Hardy and Linda Hewitt have continued to build up the record on the computerized book catalogue, which now contains about 2,800 items. In March a Library Open Evening was held at Imperial College to allow members to see the Society's stock, including some rare items not kept on the open shelves. This proved very popular and a repeat is planned for early 1995.

The Library lost an invaluable supporter with the death of Brad Ashby, but we gained a new recruit recently in the form of David Allen, who will be familiar to many members as the Secretary of the Ornithology and Ecology & Entomology Reading Circles.

Library-related matters are now handled by three officers: general issues (including servicing the Committee) by John Barrington, liaison with Imperial College (including cataloguing matters) by Linda Hewitt, and administration of the Society's archives by Dr Paul Cornelius.

The post of Archivist (Library) was introduced in the Society during the past year. Previously, somewhat scant attention had been given to the collection and storage of archival material. There are already some important records in the Society's collection, formerly stored under the umbrella of the Library though outside its immediate brief. This material had already been listed, but there is no index and retrieval is difficult. Sadly, over many years much that should have been collected has not been. Hence there are many desiderata and we hope some of these might be filled by appealing to members. Anyone having material which might be relevant to the Society's past activities is urged to offer it to the society by contacting the Archivist: 'If there is doubt, don't throw it out!' In the short term it is planned to accumulate whatever material might be offered now so that items might not slip out of reach. In the longer term a database of the material held will be prepared to enable searching.

The Society remains indebted to Imperial College for accommodation and technical services and our grateful thanks go to Mrs Czigány (College Librarian), Janice Yeadon (Life Sciences Librarian) and their staff for their support.

Finally, the Society wishes to express its thanks to all its hard-working voluntary officers who, by giving up their own free time, allow us to flourish and to enjoy such a high reputation.

Statement of trustees' responsibilities

Charity law requires the Council as trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of its financial activities for that period. In preparing those financial statements the trustees are required to:

- select suitable accounting policies and then apply them consistently;
- make judgements and estimates that are reasonable and prudent;
- state whether applicable accounting standards have been followed subject to any material departures disclosed and explained in the financial statements; and
- prepare the financial statements of the going concern basis unless it is inappropriate to presume that the charity will continue in business

The trustees are responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the charity and to enable them to ensure that the financial statements comply with the Charities Act 1992. They are also responsible for safeguarding the assets of the charity and for taking reasonable steps for the prevention and detection of fraud or other irregularities.

Treasurer's notes on the annual accounts for 1993/94

The Society's accounts for the financial year ended 30 June 1994 show a surplus of £13,737 (after making provision for the diminution in value of investments where the current market value is less than the book value), compared with a deficit of £427 in 1992/93.

Total income was £52,145, compared with £31,282 in 1992/93. This difference is almost entirely attributable to £17,730 profit on the sale of investments during the year and £3,048 (net of postage and packing) from sales of the Society's most recent book, *Larger moths of the London Area*. Receipts from the sales of other Society publications were slightly above the previous year's level. Dividend income from our investments, at £15,934 remained at the previous year's level but, following changes in tax legislation, investment tax was only recoverable at a reduced rate. Although rates of subscription were unchanged, income from subscriptions rose again, increasing by 4 per cent to £10,776. However, the amount of tax recovered on covenanted subscriptions fell by over 25 per cent as we had to issue revised deed of covenant forms and fewer members signed covenants than before. Members who do not covenant their subscriptions are being encouraged to do so.

Total expenditure rose from £36,003 in 1992/93 to £44,424. Within this total expenditure on grants was £2,626 compared with £1,020 in the previous year. Meetings and sectional costs and general expenditure totalled £10,315, 12 per cent below the previous year's level, with particular reductions in meetings and sectional costs, which will probably not be sustained, but which helped offset the costs of producing the moth book.

Report of the auditors to the members of the London Natural History Society

We have audited the financial statements on pages 10 to 11 which have been prepared under the accounting policies set out on page 11.

Respective responsibilities of trustees and auditors

As stated in the Treasurers' report, the Society's Council as trustees are responsible for the preparation of financial statements. It is our responsibility to form an independent opinion, based on our audit, on those statements and to report our opinion to you.

Basis of opinion

We conducted our audit in accordance with Auditing Standards issued by the Auditing Practices Board. An audit includes examination, on a test bases, of evidence relevant to the amounts and disclosures in the financial statements. It also includes an assessment of the significant estimates and judgements made by the trustees in the preparation of the financial statements, and whether the accounting policies are appropriate to the Society's circumstances, consistently applied and adequately disclosed.

We planned and performed our audit so as to obtain all the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or other irregularity or error. In forming our opinion we also evaluated the overall adequacy of the presentation of information in the financial statements.

Unqualified opinion

In our opinion the financial statements give a true and fair view of the state of the Society's affairs as at 30 June 1994 and of its results for the year then ended.

4 London Wall Buildings
LONDON EC2M 5NT

FRASER & RUSSELL
Chartered Accountants
and Registered Auditors

29 November 1994

London Natural History Society Income and Expenditure Account for the year ended 30 June 1994

1993 £	1993 £	Income	1994 £	1994 £	1994 £
		Income from members and supporters			
	10,348	Subscriptions		10,776	
	363	Donations		585	
	804	Tax recovered on covenanted subscriptions		594	
11,515					11,955
	1,563	**Sales:** Journals	1,592		
	(269)	*Less:* Expenses	(190)		
1,294				1,402	
62		Journal offprints		24	
	263	*Flora of the London Area*	288		
	(71)	*Less:* Expenses	(69)		
192				219	
	317	*Butterflies of the London Area*	277		
	(103)	*Less:* Expenses	(53)		
214					
				224	
—	—	*Larger moths of the London Area*	3,877		
		Less: Expenses	(829)		
				3,048	
148		Literature and surplus library stock		44	
52		Chipperfield Bequest		54	
—		Other		20	
					5,035
		Income from investments and deposits:			
	16,100	Quoted investments	15,934		
	4,505	Tax recoverable 1993/94	4,140		
	835	1994/95	1,004		
	21,440			21,078	
	315	Investment cash account		211	
	37	Tax recoverable		—	
		Profit on sale of investments		17,730	
	21,792			39,019	
	(4,291)	*Less:* Custodian's charges		(4,005)	
17,501					35,014
	75	Charities deposit fund		53	
	229	Bank deposit account		88	
304					141
31,282		**Total Income**			52,145
(36,003)		*Less:* **Expenditure**			(44,424)
(4,721)				7,721	
4,246		Decrease in the provision for diminution in value of certain investments			6,016

1994 £	1994 £	Expenditure	1994 £	1994 £
		Meetings costs, sectional and general expenditure:		
	2,418	Hire of halls and rooms	1,956	
		Lecturers' fees and expenses,		
	1,523	sectional expenses, etc.	947	
	714	Postage and telephone	867	
	469	Stationery	210	
	1,676	Services (auditors' fees, insurance, etc.)	2,740	
	87	Equipment repairs and renewals	21	
	1,432	Honoraria and expense allowances	572	
	1,534	Computer software and sundries	120	
	210	Catering (net)	12	
	1,375	Depreciation	1,697	
	310	Bank charges	334	
	(25)	Sundry	(11)	
	—	Rent	850	
11,723				10,315
		Publications:		
		Printing and expenses:		
	8,653	*London Naturalist* **72**	6,465	
	4,375	*London Bird Report* **57**	4,666	
	—	*Larger moths of the London Area*	10,795	
13,028				21,926
	1,215	*Programme*	1,232	
	3,142	*Bulletin* and *Newsletter*	3,643	
	3,904	Mailing	3,473	
8,261				8,348
1,082		Library		817
889		Publicity		392
1,020		Grants, including contributions to other organizations		2,626
£ 36,003		Total expenditure for the year		£ 44,424

1993			1994	
£	£		£	£
		Fixed assets acquired after 30 June 1985, excluding library books:		
		Computers, including ancillary equipment		
	13,857	and initial programming costs	13,857	
	143	Library equipment	143	
	1,739	Other indoor equipment	2,052	
	413	Bat detectors	413	
	2,158	Bookham hut	2,158	
	18,310		18,623	
	(15,652)	*Less*: Depreciation	(17,348)	
2,658				1,275
		Quoted investments at cost	235,799	
	(10,284)	*Less*: Provision	(4,268)	
221,624				231,531
		(Market value £375,832–1993: £394,980)		
		Current assets		
		Funds at bank and on deposit:		
	12,754	National Westminster Bank PLC	15,685	
	1,000	Charities deposit fund	1,000	
	13,754		16,685	
	807	Cash in hand	667	
	271	Payments in advance and other debtors	283	
	3,248	Tax recoverable on investment income	3,437	
	320	Stationery stocks	420	
18,400				21,492
		Less: Current liabilities		
	(4,291)	Custodian's charges	(4,005)	
	(25)	Contributions to bat boxes	—	
	(2,329)	General liabilities and accrued expenditure	(519)	
(6,645)				(4,524)
£236,037		Total net assets		£249,774
		Representing: *General Fund* (incorporating the Hindson and Castell Bequests		
236,512		Balance at 30 June 1993		236,037
(475)		(Deficit)/surplus for the year		13,737
£236,037				£249,774

R. DAY President
M. J. WEST Treasurer
29 November 1994

Note to the accounts

Accounting policies

a) Subscriptions, which are collected on a calendar basis, continue to be brought in as received. No account is taken of subscriptions in arrears until received.

b) Investment income is credited to the Income and Expenditure account together with the income tax credit receivable.

c) Provision is made for all material debtors, prepayments, creditors and accruals with the exception of subscription income (see note a above).

d) Depreciation is provided on fixed assets at rates calculated to write off the cost of each asset over its expected useful life as follows:

Computer equipment — 33 1/3% (1992: 25%)
Other assets — 20%

The depreciation policy for writing down computer equipment has increased this year to 33 1/3% (1992: 25%). This has increased the depreciation charge for the current year by £596.

e) The London Natural History Society is registered as a charity (Charity Commission Reference 206228) and as such tax exemptions apply to the income arising from and expended on its charitable activities.

Official and sectional reports for 1994

CONSERVATION

The Society has continued to play an active role in nature conservation in the capital. Links with surrounding wildlife trusts continue to be strengthened. A number of joint meetings with the London Wildlife Trust have been organized. These included a fungus foray in Haringey, which attracted more than eighty participants, and a workshop on 'Monitoring for Nature Conservation'. The Hertfordshire and Middlesex Wildlife Trust consulted the Society during its preparation of 'An Action Plan for the Lea Valley between Hertford and Ware'.

The Society expressed concern over proposals from English Nature to denotify Stanmore Common SSSI, and it is now expected that the site will be declared a Statutory Local Nature Reserve.

In March, the Conservation Officer attended the launch of the 'Watling Chase Forest Plan Draft for Consultation' and submitted a response on behalf of the Society. In August, the Society responded to the Corporation of London's 'Draft Management Plan for Hampstead Heath' after widespread consultation with interested members. In October, the Lee Valley Regional Park Authority asked for the Society's comments on their 'Draft Development Plan for the Nazeing Meads Area'. As this contains one of the richest sites for bats in north London at Admiral's Walk Lake, the Society's mammal recorder was consulted and a joint response submitted.

David Bevan, *Conservation Officer*

BOTANY

As usual, the Botany Section has had an active year. There were three formal meetings: at the AGM on 23 November 1993 Dr S. Owens gave an illustrated talk on the complexity of the flower; on 27 January 1994 Dr P. Brandham gave advice on botanical photography with many useful slides, and on 27 April there was a very well-attended talk by Professor Clive Stace on the British flora.

Informal meetings included the perennial favourite 'Best Botanical Slides of the Year' in January, and another successful general plant identification meeting in September; in March there was a microscopy workshop which was a joint meeting with Ecology and Entomology, where members could explore the fascinations of plant anatomy and insect morphology.

Field meetings began in February with a visit to Darenth; after that there was a varied programme of visits to Warley Place, Hampton Court towpath and Home Park, Barnes Common, Wimbledon Common (general botany for beginners), Coppermill Down, Joydens Wood (grasses for beginners), Oxleas Wood, Fishers Green, Northfleet, the Isle of Dogs, Kings Meads, Hyde Park, Epsom Common, Crofton Heath, Chobham, Cockmarsh, Howell Hill, Haringey (a joint fungus foray with the London Wildlife Trust which was attended by over 80 people, which must be something of a record), and Harrow Weald to look at ferns.

We are grateful to members of the Committee for their continuing attendance and support. This year we are delighted to welcome a new indoor meetings secretary, Mrs Pat Smith; the chairman Rodney Burton has had to organize indoor meetings himself for the past two years. Finally we would like to thank all those who have given lectures, led field meetings, kept botanical records, and shared their expertise at informal meetings; we are fortunate to have so many informed and qualified people prepared to help us in this way.

Rodney Burton, *Chairman*, Mary Clare Sheahan, *Secretary*

ECOLOGY AND ENTOMOLOGY

The sudden death of our secretary Brad Ashby on 9 January 1994 shocked us all. He joined the Society in 1939, primarily as an ornithologist, but during the 1950s turned his attention towards ecology and entomology. Brad joined the Entomology Section committee in the mid 1960s and remained on the committee following the merger of the Entomology and Ecology Sections in 1974. In 1984 he volunteered to become sectional secretary in succession to Maureen Currie who had been in office for eight years. Brad's enthusiasm on behalf of the Section, both in the field (especially at Bookham) and on committee, is already greatly missed. During 1989 and 1990 he was also president of the Society — an onerous task which he accomplished with equal enthusiasm, earning the respect of Council and members alike. In 1987 Brad launched the Section's newsletter, *The London Atalanta*, and until his death produced twenty-eight first-class issues. A full obituary of Brad by our committee members Keith Hyatt and Eric Groves was published in last year's *London Naturalist*, No. 73. Ray Softly, a long-standing member of the committee, who stepped into the breach caused by Brad Ashby's death, was made an honorary vice-president during the year.

Later in 1994 we suffered a second blow with the departure from the Society of our chairman and mammal recorder Richard Goulding, who had been in office since 1988. His decision to resign was received with regret. Richard contributed much to the Society during sixteen years of membership. We are pleased that Clive Herbert has stepped in as mammal recorder.

A further, but less conspicuous, change is that the Bookham Common Survey has once again become the direct responsibility of council, though as before it has its own chairman, secretary and committee.

As usual the Section's recorders have been very active, but perhaps the outstanding event is the rediscovery by Edward Milner of the spider *Atypus affinis* on Hampstead Heath after an absence of a century. Colin Plant continues to collect and collate data on the Microlepidoptera of Middlesex. Clive Herbert has begun a gradual programme of accumulating records of mammals, other than bats which are already adequately recorded. Dr Daniel Hackett, although not yet an official recorder, is collecting data on London's beetles.

Indoor meetings included Alwyne Wheeler, our recorder for fishes, speaking on 'The Changing Animal Life of Epping Forest', an area with which he has had a long association; Linda Pitkin, whose title 'Beneath the Waves' was illustrated with stunning slides of underwater life from British and tropical waters; our annual joint meeting, this year hosted by the BENHS, entitled 'Biodiversity in Britain — where is it?' and 'how do we keep it?', was conducted by Rachel Quinn and Ian Maclean; and at the AGM in October, our Odonata recorder Stephen Brooks reported on the current state of dragonfly recording. The annual Parmenter Lecture was given in April by Dr Peter Kirby on 'Sites of Potential Interest for Invertebrate Populations'. The Section also held two informal meetings, one a microscopy workshop, and the other when members showed slides of natural history from far and near.

Destinations for fields meetings were the Reptile House at London Zoo, Tring for general natural history, Cheshunt for floodplain woodland and orchids, Hampstead Heath for beetles, and the Lea Valley for spiders.

The Section also represented the Society at the Amateur Entomologists' Society annual exhibition at Kempton Park in October, where John Thompson, the Section's recently-elected chairman, and Dan Hackett, gave out information about the LNHS and sold a considerable quantity of the Society's publications.

JOHN A. THOMPSON, *Chairman*, CATHERINE SCHMITT, *Secretary*

ORNITHOLOGY

Probably the most important development during the year was the decision to put the Society's bird records on computer, starting with those for 1994. This will make it much easier to extract data for a particular site and it will, therefore, be useful for conservation purposes.

During the year there was a good series of indoor meetings. Subjects ranged from Canada geese and Brent Reservoir through woodland management and camouflage and mimicry to bee-eaters, Senegal, Costa Rica, and Russia. There was also a varied programme of outdoor meetings.

Some members are participating in the Wildfowl and Wetlands Trust's London Lakes Rehabilitation Project. This involves monthly wildfowl counts at a large number of sites in the London Area, many of which are not covered by the long-running Wildfowl and Wader Counts. The results are already providing the Trust with some useful information. Members are also taking part in the BTO's new Breeding Bird Survey. Good progress has been made with the production of the maps for the new breeding bird atlas.

Finally, mention should be made of the *London Bird Report* for 1992 which was published during the year and was awarded third place in the *British Birds* annual competition for the best bird report. Mark Hardwick and his team are to be congratulated.

HELEN BAKER, *Chairman*, ANGELA LINNELL, *Secretary*

RAMBLERS AND ARCHAEOLOGY (INCORPORATING GEOLOGY)

The year has proved quite a rewarding one with many well-attended outings, and now with the incorporation of the Geology Section, there has been added interest. Richard Butler has revived the Geology Section almost single-handed, and this is much appreciated.

Helen Hartley has been ably arranging many of the field meetings, but we would like a little more help in leading from others, especially for outings outside London. The British Naturalists' Association have been joining us on some of our rambles, and vice versa, and have added their expertise.

The speakers for our indoor meetings have been much appreciated, especially as some are of general interest, and the alternative venue at Conway Hall has been satisfactorily renovated recently. Finally, any offers to join our Committee would be welcomed.

RICHARD E. BUTLER, *Chairman*, DOREEN E. WOODS, *Secretary*

SOUTH-WEST MIDDLESEX

At one period the continuation of the Section, which has now been in existence for forty-four years, was in doubt, being without a programme secretary and secretary. However we are now in good running order with a full complement of officers: Gordan Freeman has now become our programme secretary, replacing Suzanne Lee who resigned because of pressure of work, and Mark Radford is once again our secretary.

During 1994 we organized twelve field meetings. The average attendance was eleven. In three of the meetings the numbers included members of other societies which joined us.

We have been to Chobham Common: Black Park, Iver; Staines Reservoirs; Hounslow Heath; The Welsh Harp, Hendon; Richmond Park; Thursley Common; Staines Moor; Bushy Park; Kew Gardens; Windsor Great Park; and walked along the towpath from Hampton Court to Sunbury.

We are indebted to our leaders, which for most is a regular yearly commitment, duty and pleasure being combined, as members are enthusiastic. They were this year, David Harris, Tony Leppard, Mark Radford, Marjorie Shattock, Bill and Audrey Thorne, Ruth Turner, and Peter Williams.

The subjects of our seven indoor meetings were: 'Members' Slides', but abandoned due to snow; 'A Bird Watcher in Sri Lanka', Tony Leppard; 'Plants, Places and People Around the Country', Marjorie Shattock; 'Kew Today', Laura Ponsonby; 'The Isle of Wight', Paul Jackson; 'Dormice', Pat Morris; and the AGM followed by a quiz. The average attendance was sixteen.

RAY G. BOWDEN, *Chairman*, MARK RADFORD, *Secretary*

Records for science and nature conservation

RUTH DAY

18 Zenoria Street, London SE22 8HP

Presidential Address delivered at the Annual General Meeting on 12 December 1994

The aim of our Society, as set out in our Rules, is to study and conserve the natural history of the London Area, and it is the duty and privilege of a president to do everything possible to further that aim. The Society goes back to 1858 and we are very fortunate that we have managed to keep a great deal of our history. This is a tribute to the quality of work done by our predecessors, but it is also because we have published so much in our journals.

My first slide shows the nesting territories of wrens in Eastern Wood at Bookham Common. It comes from the collection of about 200 slides donated to the Society last month by Suzanne Beven, the widow of Dr Geoffrey Beven, and it shows continuous work on this site, Eastern Wood, from 1948 to 1971 which is a very impressive run of data.

In bygone years the Society had a Plant Galls Section which did a terrific amount of work and brought together a major collection. When Armand le Gros died in early 1976, this collection was nearly thrown away, but was rescued by Keith Hyatt and placed in the Passmore Edwards Museum by another vice-president, Colin Plant, who curated it and collaborated on a paper describing its contents (Hollins and Plant 1988). There it remained until this year, and we were pleased that it was suitably housed. Now, sadly, the Passmore Edwards Museum has closed down its biology section and our plant galls collection is looking for a new home. We are making enquiries from suitable museums, and we have every hope and expectation that we shall find one (Note 1). The point I wish to make, however, is that we have a continuing responsibility to look after a major collection which has been handed down to us by earlier naturalists. I don't know much about plant galls, but it is notable that these days historical material is used for purposes which those who collected it could never have imagined. I attended a lecture in 1992 at the Institute of Zoology by George Sunnucks, who was working on the population genetics of knopper gall wasps. He was using old plant galls from museums for DNA fingerprinting to determine the geographical spread of individual populations of these insects in historical times. Egg collections are another example. In the 1950s and 1960s, there was serious concern about the effect of DDT and its derivatives on the metabolism of birds, especially raptors. By comparing contemporary eggshells with pre-war eggs from museums, it was possible to prove that birds with high concentrations of DDT in their tissues laid fragile thin-shelled eggs.

When you collect anything or note down any record, you can never tell what use will be made of it by those who come after you. You can be pretty sure, however, that if you are as precise and meticulous as possible, this material will be valuable in the future — because, of course there can never be any more. That which is recorded in the passing moment is there — if we don't lose it — for generations to come.

My final example is not a collection, but a record. When Max Nicholson was working on birds in inner London in the 1920s, like all good ornithologists, he counted them. I understand that whenever an ornithologist sees more than one bird he starts counting. It is a reflex. So Nicholson counted all the species he found in different habitats. He was not really interested in the commonest of all birds, the house sparrow, but thought he ought to include it for the sake of completeness. House sparrows are now in a decline, and Helen Baker is working on their population in inner London. Fortunately, she has Nicholson's data from the 1920s for comparison. So records are immensely important, not just for surveys taking place at the time, but also for uses that will arise in future, that we cannot possibly imagine now.

We must not lose things. The photograph which is now on the screen shows Bookham Common from the air in 1947. Until we were given the Beven collection of slides, I was afraid it had been lost. If you compare it with the next slide, which is a similar aerial view in 1961, you will see immediately that the tree cover increased enormously in the interim.

The National Trust are very keen to have this sort of historical material to help them manage the site, so now we have the slides, they can borrow and copy them.

In addition to keeping material, we have got to be able to get at it. We not only want to have our records, we want to be able to retrieve them. It is sometimes difficult for naturalists who have worked on the many distinguished publications the Society has produced throughout its history to realize that if we get it right, the age of endlessly transcribing things from one piece of paper to another is — or at any rate should be — at an end. The role of the computer is to key data into one machine once — making sure it is in a compatible format — and after that you can manipulate it and copy it and reproduce it and pass it on to others as many times as you wish without ever having to type it again. Possibly that is an over simplification, but we are determined to get as close to it as possible. So, if you are only going to have to enter data once, the precision that is so important in these other examples I have cited, is even more vital, because if you do not note down all the information you have at the time when you make the record, you will never, ever get it back again.

Our ornithological recorders have started to use Peter Fraser's database program COBRA (COunty Bird Recording Application) (2) and three of our other recorders have just installed RECORDER, by Stuart Ball (3), which is compatible with it. These programs are what is available now. Inevitably they will evolve. Anyone who has ever used applications software knows that you very rarely go on using one beloved program for more than about two years. Programs are regularly upgraded and you have to keep moving on to the new ones in order to keep pace. If, however, we keep to mainstream programs which are the standard for their day and accepted by the people doing recording, our data will never have to be rekeyed. It will be kept in machine-readable form and transferred into whatever is the current package.

This development is tremendously important and is something we must pursue with all the vigour at our command. Building a database will mean that our Society will not only have records, it will have readily-accessible information for its surveys and publications. Other people want our data too, but at the moment, it is very difficult to retrieve. When we get a bona fide request to which we would like to respond, we have to write to a large number of different recorders, all operating different systems, and as and when these good people have the time, they look through a lot of records stored primarily by species to see whether they have anything relating to a particular site. We must get away from this. It goes back to the days of the quill pen! I believe that what we need is one database, which is accessible both by site and by species, and probably by a number of other things as well — like who recorded the observation, or the literature reference — so that we can produce sensible reports as and when they are needed. Getting there is going to be a tremendous amount of work, but I am convinced it will be worth it. We are very fortunate in this Society to have recorders who really know their subject. I am sure you have all heard the old computer expression GIGO, garbage in, garbage out. I feel sure that validation by our recorders will significantly reduce the amount of garbage that we put into our database.

Our recorders, however, are expert naturalists. They are not VDU operators. They are not typists. They have other things to do with their time. I am seriously concerned at the time or the resources which will be needed, and I don't know which it will be, to put in the large number of historical records we still retain and which are very valuable. There are masses of them.

Keeping records is generally held to be a *good thing*, but I am far from convinced that all our members are clear about their purpose and function. When I joined the Society in 1985, Colin Plant, who was then president, was doing his best to promote recording. He decided that all new members should be sent a recording form and I duly received a piece of paper with headings for 'Species', 'Date' and 'Remarks'. I looked at it and thought 'What is this for?' I was doing an ecology degree at the time and so, as all students do, I thought I knew quite a lot about my subject, but I had never heard of recording. This is not surprising as, even today, the recording done mainly by amateur naturalists is totally unknown to the academic biologist working in a university. David Bellamy, when he came to speak to this Society (4), urged us to carry on keeping records and I think he meant we should do so principally for their value in nature conservation. They also have an important scientific role, and quite often, the same record can serve both functions. If it is to do so, however, precision is all the more important. Tetrads do not help you to locate an important site. We must either record by site or by six-figure grid reference, if we are to give our records the dual purpose, which in the age of computers they should have. So how do we get this precision?

As I say, I came new to recording. I could just about do a map reference, but I found it very difficult doing one in London from those pink 1:50,000 Ordnance Survey maps because they do not show the street names. Then I discovered the *Master atlas of Greater London* (5), which is a lot more helpful. It shows both the street names and the OS grid scale, and I have found that it has revolutionized my ability to produce map references. Furthermore, although it lops off a certain amount of Hertfordshire it covers practically all our area, and is not outrageously expensive.

The use of records for conservation has gained in prominence largely for political reasons, and it is we, the conservationists, who have developed the political scene to what it is now. It is our political influence which has brought records into the planning process, into environmental impact assessments and even to the implementation of the UK Biodiversity Action Plan. At Rio de Janeiro in June 1992, the heads of more than 100 nations met at the Earth Summit with the aim of installing a system of planetary management to preserve the Earth's atmosphere, soils and biological resources. They signed an 'Earth Charter', which was a declaration of sustainable development, and also a lengthy document called 'Agenda 21' which set out a list of tasks for the coming century. The majority, including the British prime minister, John Major, also signed legally-binding conventions on climate change and biodiversity. These commitments then had to be ratified nationally and implemented at both national and local level: this was done in June this year (1994) and the United Kingdom now has an Action Plan. The government has agreed it has a duty to conserve the biological diversity of this country. Naturally, it turned to English Nature (and the other two nature conservation agencies) to sort out a method. English Nature have responded with a scheme of 'Natural areas'. They have tried to group habitats into areas, based upon the underlying geology and the surface vegetation, and produced a map of the result. The Biodiversity Convention obliges them to be aware of the total wildlife resource, not just in their protected sites, but in all the natural areas and thus in the whole country. They hope they can build corridors between the sites to sustain the natural migration of species because it makes sense biologically. Species do not stay meekly in protected sites. Eventually, unless there is immigration and emigration, biodiversity will be lost. This is something which it is extremely difficult to explain to politicians. If you put enough pressure on them, politicians will sign conventions, but they cannot think any further ahead than the following week. Their absolute limit is the date of the next election. Of course, it is well known that natural processes take time. I am reminded that I once read somewhere of an adviser to the UN Food and Agriculture Organization. He said, plaintively, 'It takes a hen 21 days to hatch an egg, and the World Bank wants me to put 21 hens on the same egg and hatch it in one day!' That, I think, illustrates well the dichotomy between the politicians' time-scale and the natural time-scale. In order to conserve species, however, the government agencies need to know where they are — and the only people who have this information are the amateur naturalists. Recording has become split into two types — 'Species recording', which is what we do, and 'Habitat recording' which is done by official bodies such as English Nature and the London Ecology Unit. The split is artificial, and the reason for it is money. I was reading through the file on our former Records Committee, and I noticed that the London Ecology Unit, which was then part of the late-lamented GLC, found that, although they used some of our data in their early publications, our tetrads were inadequate for planning purposes, and this was one of the reasons they adopted a different approach and commissioned the vastly expensive professional survey of all the natural history sites in London.

The London Ecology Unit developed a methodology which is totally at variance with ours. They decided that there were three classes of site: those which were of Metropolitan Importance, i.e. significant on a London-wide scale; those that were of Borough Importance

— really good for that borough; and those that were of Local Importance, because they were the best that could be found in that particular area. While they applied the same sort of criteria which might be used to identify SSSIs, they also included the importance of wildlife to people. So for metropolitan and borough sites, the criteria were: richness, diversity, ancient habitats and so forth, but for local sites, they wanted to find a natural area that was near where people lived, preferably one that had some existing protection: it might perhaps be a churchyard or a cemetery or something, and had public access. They sought to conserve nature in a city in terms of the people as well as the wildlife.

A related approach to habitat recording is 'Phase One Habitat Survey', as defined by the Joint Nature Conservation Committee. Apparently, phases two and three also exist, but the only book available at the moment deals with phase one (6). It consists of a fairly superficial reconnaissance to determine the extent and distribution of the wildlife resource in an area. In some ways the technique is similar to what was done for the GLC survey. The surveyor identifies different types of habitat and colours his map accordingly. The book recommends using a car in the countryside, but a bicycle in the city, and it even tells you which coloured pencils to buy. The result is a coloured map showing different broad classifications. Nature is not like that — no two habitats are alike — but at least it provides a rule of thumb for classifying areas where there might be some nature conservation interest. Even this quick and dirty type of survey has not yet been done for all the counties of England, and England is supposed to be the best-recorded country in the world. Is it surprising that they need the amateurs?

Our Society is an expert and dynamic group of people. Our fieldwork is very good, but to bring our recording up to date, we need to use modern methods and modern software. Modern software is site based and other users of the RECORDER package specify a site in the English Nature way — by one map reference in the middle. They then draw a boundary round that site on a paper map. This slide shows an example map from Surrey Wildlife Trust's Recorder Project. I photographed that about two years ago. As you can see, it is reasonably clean and it is reasonably clear. When I went back to have a look at some of their maps a couple of months ago, I discovered that in addition to the red lines you see on the slide, they had green lines that were overlapping them in slightly different directions. Older records had defined the same sites differently and the map was getting very confusing. I hope we shall be able to improve on that method.

What records do we keep at present? My next slide shows the distribution of Canadian fleabane from *The flora of the London Area* (Burton 1983). It is the nearest I could find in the atlas to a plant that has spread very much more widely since that time, the Guernsey fleabane *Conyza sumatrensis*. Rodney Burton has recently been collecting records to identify its spread, but in 1983 he didn't even think it was worth having a map for it. This is an ecological change, which is obviously of scientific interest, but not likely to be of conservation significance, except perhaps in a negative sense. The plant is an introduced alien and not even very pretty, but as an ecologist, I find its recent spread fascinating. This is recording in the way we have always done it, and a tetrad map shows a clear picture on a London-wide scale. My next slide shows another distribution map, from Clive Herbert's recently-published 'Dragonflies of the Borough of Barnet' (Herbert 1994). That is 1km^2 data, so it is more precise than tetrads. It shows the distribution of the blue-tailed damselfly *Ischnura elegans,* probably the most common and widespread damselfly in London. You can compare it with the distribution of other species, but it does not actually enable you to find out where it is, at least not without a certain amount of detective work. I wonder if it would have been a good idea to have a list of sites as well as these maps. I think this demonstrates that mapping is excellent on a national scale, good on a county scale, but becomes a bit restrictive when you reduce the scale to that of a borough. London, however, is organized into boroughs and there is clear need for information on that scale.

Finally, what should we record? Once again, we are fortunate in having expert recorders who provide guidance on what they think is important. But don't forget, they are not necessarily right. They can only tell us what they think is going go be needed from the viewpoint of the present. If Max Nicholson hadn't counted sparrows, Helen Baker wouldn't be able to use his figures. Records have become very topical. A great deal is happening in this field. I believe that the Society needs to get organized now. I believe we need to put considerable effort and resources into it in order to keep our place as the leading recording organization in our area.

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HERBERT, C. (Ed.). 1994. *Dragonflies and damselflies of the London Borough of Barnet: a provisional atlas*. Privately published. Available from Clive Herbert, 67a Ridgeway Avenue, East Barnet, Herts. EN4 8TL.

HOLLINS, M.J. and PLANT C.W. 1988. Plant galls and the London Natural History Society, including a catalogue of the Society's collection at the Passmore Edwards Museum. *Lond. Nat.* **67**: 119–146.

Notes

1. Since this Address was delivered, the collection has been housed at The Natural History Museum at South Kensington.
2. Available from Peter Fraser, 12 Redland Court, Bristol BS6 7BQ. Tel. 0177 9246255.
3. Available from Eva Leck, Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough PE1 1JY. Tel. 01733 62626.
4. Bellamy, David. *Natural History in a Troubled World*. An address delivered at a General Meeting of the Society on 12 January 1992.
5. *Master atlas of Greater London*. Edition 6A.1991. Geographers' A–Z Map Company Ltd. £14.50. ISBN 0 85039 002 B.
6. *Handbook for Phase One Habitat Survey*. JNCC.1993.ISBN 0 86139 636 7. Available from Natural History Book Service Ltd, 2–3 Wills Road, Totnes, Devon TQ9 5XN. Tel. 01803 865913.

Book reviews

A new key to wild flowers. John Hayward. Cambridge University Press, Cambridge. Revised edition, 1995. 278pp. £12.95 (US$24.95) (paperback). ISBN 0 521 48346 8.

A new key to wild flowers was first published in 1987, but was not reviewed then in *The London Naturalist* and merits close attention here now. It had its origins in keys produced as hand-outs for amateur students attending field study centre courses on wild flowers, and retains their practical approach. The user is taken through a series of choices, many of them illustrated by small line drawings by Michael Hickey, until the scientific and English names of the plant are reached. Most of the choices are not numbered and it is important therefore that they are taken in strict order. Very rare plants are excluded, as are 'critical' entities like brambles and hawkweeds, and hybrids (which make it certain that the name *Potentilla anglica* will be arrived at when identifying similar hybrids which are commoner than this species). The process of identifying wild flowers is not made to seem easy at a glance, but then there are large numbers of species to be covered, and with a small amount of practice this arrangement, which of course is very demanding of the author, is much more likely to prove successful than matching plants with a succession of photographs.

Good marks for Mr Hayward, then, but bad marks for the publisher. This 'revised edition' is exactly the same as the first, except that the scientific and English names have been changed to match those in CUP's other effort in this field, Stace's *New flora of the British Isles.* All the names which were wrongly spelt first time around are wrongly spelt still: *Aphanes* still has only one species, and the wrong page number in the index; there is still a statement that a rule will be found on the back cover (there never was); there is even an unaltered statement that 'The names used in these keys are those used in *Excursion flora of the British Isles* 1981'! Bad marks, too, for issuing a book like this in a format which will stand no wear at all. This is well worth having in a field study centre, if the budget will run to an annual replacement copy.

RODNEY BURTON

The pocket guide to birds of Britain and Europe. Martin E. Walters. Dragon's World, London. 1995. 160 pp. £7.95. ISBN 1 85028 363 X.

Among the plethora of birds books currently in print, field guides must be best sellers, as all birdwatchers, and perhaps most naturalists, own at least one and many own several. Publishers, recognizing the popularity of birds and guides to their identification, continue to produce completely new titles or revised versions of older volumes as they aim to supply ideal guides for beginner or expert. Dragon's World's new identification guide is superficially quite attractive, although its spiral-bound format is unlikely to stand up to much use in the field.

The most cursory examination of text and illustrations shows that it has many faults. The introductory section is poor, and illustrations range from good to appalling. There is only one picture per species, so differing male and female, or breeding and non-breeding plumages, are not shown. The scale of the illustrations is often strange, for example, the depiction of the lesser spotted woodpecker is larger than the great spotted woodpecker, whilst the carrion crow appears smaller and more delicate than its sibling subspecies the hooded crow. Other species are shown in garish, inaccurate colours, or strange poses.

Although Dragon's World makes a donation to The Wildlife Trusts for every pocket guide sold, I cannot recommend this book.

VICKI HARLEY

John Benbow (1821–1908) and the bryophytes of north-west Middlesex

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Summary

John Benbow of Uxbridge, corn miller by profession, was an able botanist, dedicated especially to the flora of his native Middlesex. His publications were few, consisting of short papers in the *Journal of Botany* from 1884 to 1901, but around 1900 he recorded his observations comprehensively in an unpublished *Flora of Uxbridge and district etc.* In 1887 he was elected a Fellow of the Linnean Society.

In the course of his later years he studied in detail the area within walking range of his home, in particular Ruislip and Harefield districts, and the banks of the Grand Junction Canal. He started to collect mosses in 1886, but was frustrated by eye trouble. A few years later he was able to return to them, and during the 1890s was outstandingly productive and successful in recording bryophytes. He found many species new to Middlesex, particulars of which he published in the *Journal of Botany*.

On his death Benbow's substantial herbarium was donated by his sons to The Natural History Museum. The vascular plant specimens were in due course incorporated into the national collection, but the bryophyte material was stored and has only recently been examined. This includes some 700 moss and liverwort specimens from north-west Middlesex, representing 166 species, subspecies and varieties. These confirm and supplement the particulars given in his *Flora* and allow checking of his published lists. A catalogue of these specimens, with their accompanying notes, is presented, together with an outline Benbow's life. Comparisons are made with the records of other collectors in the same area, and the principal habitats then and now are briefly described.

Details of recent records from this area are provided in two appendices. One is a catalogue of moss and liverwort specimens collected in Middlesex by J. C. (Jack) Gardiner (mainly during the early 1980s), and presented by him to The Natural History Museum in 1988. Although these represent the county as a whole, many are from the Ruislip and Harefield districts. The second appendix lists specimens found in Benbow's territory by Elinor Wiltshire from 1992–1995.

The map (Figure 2) broadly indicates locations of the main sites referred to. For full details of the area the *A–Z North West London Street Map* (from the nine-sheet Master Map series) is recommended.

Nomenclature and arrangement of species throughout are in accordance with Hill, Preston and Smith (1991–4).

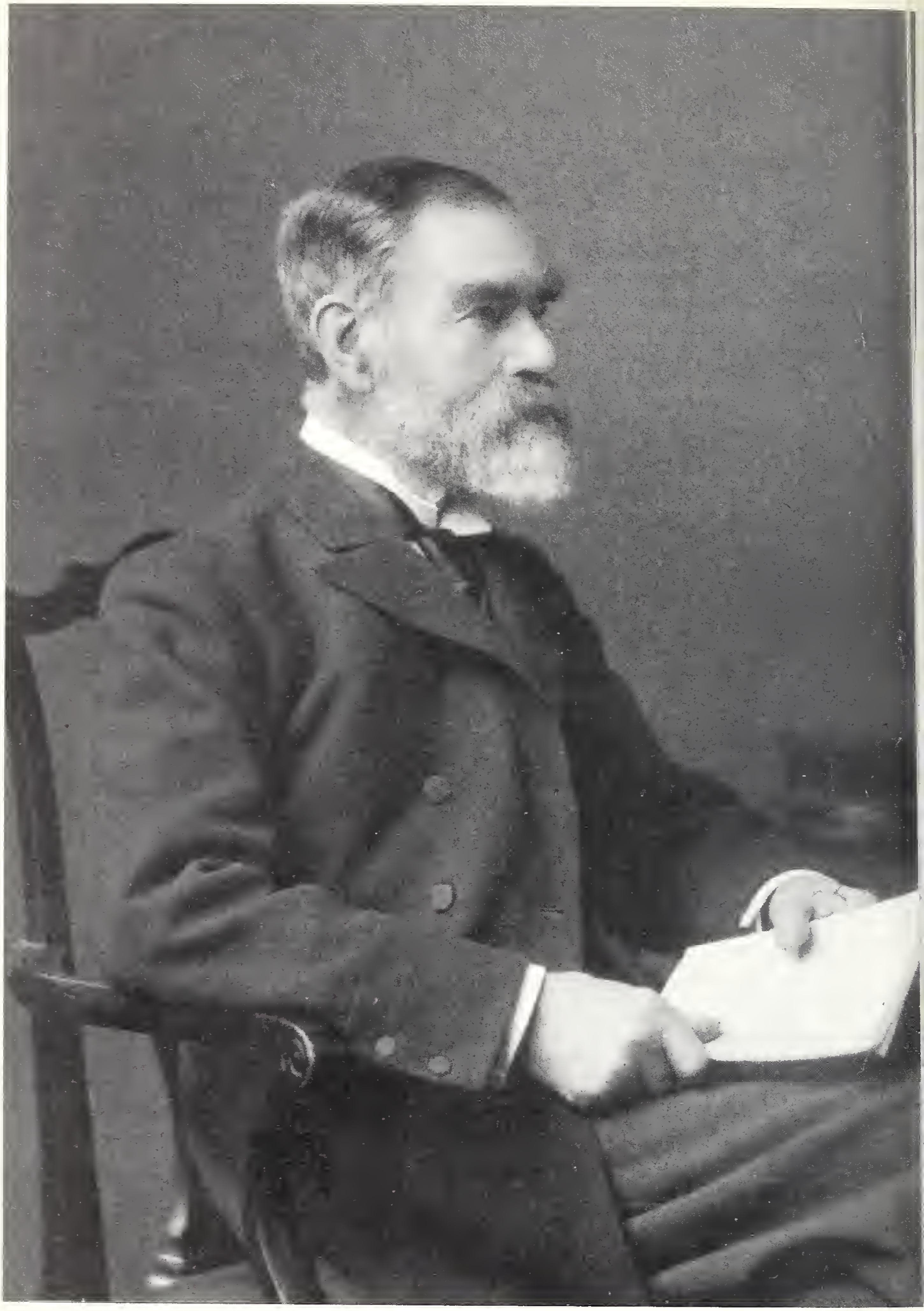


FIGURE 1. John Benbow (1821–1908) *Photo courtesy The Linnean Society of London.*

John Benbow

He was of good stature and handsome bearing, of keen intellectual tastes, and had a quick ısight into character.' These few words by Druce (1908) provide the only surviving personal npression of John Benbow (Figure 1). About him and his family very little information is vailable, and has been gleaned from obituaries (Anon. 1908, 1909, Druce 1908), census nd local official records, and from the brief comments interspersed through his herbarium.

John Benbow was born in Maidenhead, Berkshire on 8 March 1821, and was educated t Dr Trimmer's School in Putney. His father, John Bradley Benbow, a miller, came from Vorcestershire, and his mother from Hambleden, near Henley-on-Thames In 1838 the amily settled in Uxbridge, where the corn trade was then booming. Young John Benbow ecame a noted horseman, for many years following local hounds until in 1851 he lost the ight of an eye in a riding accident. By this time his father had established himself at Cowley Hall Mill, employing five men, two probably being his sons John (aged 30) and Clifton (19).

By 1861 the business had expanded, employing ten men and two boys. John was under-nealman and Clifton was corn-dealer. Both were married, John already with two sons. oon his father died and John inherited the business, but his ownership was brief. In 1864 he mill was destroyed by fire and the family lost both livelihood and home. From then ntil his retirement John Benbow ground for a neighbouring mill.

Meantime the family moved house on several occasions. Addresses included Cowley Cottage immediately after the fire, Grosvenor House, The Greenway in 1871, and Dower House in the same road a decade later. By 1886, when Benbow was sixty-five, they had ettled in Rathaspeck House in Park Road, a new development beside Uxbridge Common nd an ideal base for his botanical forays. However in 1904 the extension of the Metropolitan Railway from Harrow to Uxbridge cut across Park Road and this house was demolished. His last home was The Mount, Harefield Road, in the same neighbourhood. Here he died n 10 February 1908, his wife Adela having predeceased him by a few months. He is ouried in Hillingdon cemetery.

They were survived by their four sons: John Edward (b. 1858), an officer in the Indian Army; Arthur (b. 1860), a civil engineer; Herbert Clifton (b. 1862) and William Leonard b. 1864); and an Indian-born grandson, John, known as Ivo. All figure in notes which accompany his specimens, as does his nephew H. B. Bird. In particular there are many eferences to Herbert and Leonard, who climbed in Snowdonia, Scotland and the Lake District, and who supplied him with specimens of montane mosses. In September 1896 hey took him on holiday to Wales, where they variously fished, painted, picnicked, and gathered mosses and liverworts on Cader Idris.

Benbow 'early took a great interest in botany, and between 1860 and 1870 gave great attention to the varieties of British ferns, systematically searching Somerset, Devon and Cornwall, and also discovered some beautiful varieties or sport of ferns in Black Park, near Slough. Subsequently he studied the willows and brambles, adding several species of the atter to the flora of Bucks and Middlesex. After he was sixty he took up the study of nosses which he pursued with great ardour' (Druce 1908).

Benbow's enthusiasm for mosses had been stimulated by the meagre and out-of-date oryophyte list published in Trimen and Dyer's *Flora of Middlesex* (1869). In the *Journal of Botany* (1894) he wrote:

> 'It is curious to note how very ancient are some of the records for quite common plants: for instance there are none for *Racomitrium canescens* [*R. elongatum*] (growing abundantly near me on Uxbridge Common) since the middle of the last century, nor for such ubiquitous species as *Diplophyllum albicans* and *Metzgeria furcata* since Buddle's record nearly 200 years ago! Evidently the metropolitan county has been unaccountably neglected in this division of its flora.'

Most of Trimen and Dyer's list had been contributed by Dr R. Braithwaite who lived from 1824 to 1917 and was author of *The British moss-flora* (1887–1905), and The Revd W. M. Hind (1815–89), curate of Pinner and authority on the flora of Harrow. Hind's records related to the latter area, while Braithwaite's were mainly from Hampstead. There are only three references to sites in north-west Middlesex. Braithwaite supplied one Harefield record of *Leucobryum glaucum* which had been made by his father-in-law N. B. Ward (1791–1868), and another, of *Encalypta vulgaris*, came from The Revd W. W. Newbould (1819–86). Hind reported *Barbula fallax* from Ruislip. Such was the situation which Benbow set out to remedy, but he immediately encountered an almost insuperable obstacle. The use of a microscope is essential to the study of mosses, and in this he was severely handicapped by his damaged eye. In an early draft of his *Flora* he noted:

> 'During the winter of 1885 I made an attempt to determine and arrange the mosses and liverworts collected in the district, but the constant use of powerful lenses brought back the old weakness of the eye injured in 1851, and I was forced to abandon the task.'

He was also hampered by the lack of a suitable textbook, but publication in January 1886 of J. E. Bagnall's *Handbook of mosses*, one of a series for 'Young Collectors', met his needs. He was soon in touch with Bagnall, who lived in Birmingham, sending puzzling specimens for confirmation or determination. An early example was *Cratoneuron filicinum* which came back marked 'Yes — J. E. Bagnall', an endorsement which was to accompany many future specimens. During April and May 1886 Benbow collected a number of mosses but was once more frustrated by his old injury. In 1887 he noted in his draft *Flora*: 'The eye still troublesome, unable to use the lens or critically examine plants — often unable to *read* for days'.

He did not return to mosses until the beginning of 1891. On 21 January he collected a specimen of *Fissidens taxifolius* by Ickenham Road. Then on 8 March, his seventieth birthday, he found *Rhynchostegiella tenella* var. *litorea* at Harefield — 'the first discovery of it in Britain'. This claim was challenged by the leading bryologists Nicholson and Mitten but H. N. Dixon, in *A student's handbook of British mosses* (1896), gives Benbow equal place with them. Subsequently Benbow found it many times, but it has not since been recorded in Middlesex.

Throughout 1891 Benbow made some dozen moss-hunting walks within range of his Uxbridge home, but the following year the number had risen to around sixty. On 18 April he found *Dicranum flagellare* in Ruislip woods — 'new record for Middlesex and second for Great Britain'. During 1893 he was equally energetic, and productive of many more vice-county records. In 1894 he published these in two issues of the *Journal of Botany* (Benbow 1894*a*, *b*). In a brief introduction to the first he wrote:

> 'The list of mosses appended to the *Flora of Middlesex* is so deplorably meagre that any additio to it is to be welcomed: indeed, the following contribution, though small enough, amounts to abou one-third of the number at present recorded. The species enumerated below were all, with on exception, collected in the extreme north-west angle of the county, between Uxbridge and th junction of the Herts and Bucks boundaries at Springwell, a strip of about seven miles in length and from one to two miles in breadth . . . I am greatly indebted to Mr J. E. Bagnall for his kind assistance, and for naming the more critical species.'

During the next few years Benbow continued to look for mosses, and in 1896 and 189 published two further short lists in the *Journal of Botany*. He reckoned that in all he had contributed 72 new vice-county records, but with allowance for errors, repetitions, nomenclatural confusion, doubtful specimens and taxonomic changes, the true figure is nearer to 55. This represents about a 50 per cent addition to Trimen and Dyer's total for th whole of Middlesex. He also added nine liverworts to their list of about 20.

The new century had dawned before he brought his fieldwork to a close. On 22 January 1901 he again found *Rhynchostegium megapolitanum*, first seen eight years before. Besid the specimen he noted: 'death of Queen Victoria'. On 8 March he collected another specime from the same spot and marked it 'my 80th birthday'. This did not mean that he was givin up. On 29 May he walked to Farnham Common in Bucks. and found *Aulacomnium palustre* A lengthy note accompanies the specimen:

> 'The hottest day I have recorded in May for 20 years. This is the *third* time running I have walke to Burnham Beeches in the hottest days on record! — in June 1900 when so many died at Aldersho — and 23 July, the hottest day recorded for 60 years. Walked some 24 miles in it today withou much discomfort (as was the case on the other occasions also).'

As Druce (1908) relates, Benbow's enjoyment of mosses never dimmed: 'It was always leasure to visit him even in late years, as when his walking powers had given out, he was ually to be found with his one available eye examining mosses with keen delight.'

Other records

obably the earliest record of mosses in this territory was made by John Blackstone, othecary and botanist (1712–53), who often stayed with his mother's family at Harefield d in 1737 published a catalogue of plants found in the neighbourhood. This refers to two ecies of '*Muscus*' but both are lichens. He published another work, *Specimen botanicum* lackstone 1746) listing rare and local British plants, in which three mosses from Harefield e mentioned. In pre-Linnean fashion each is described according to Ray's *Synopsis* with series of Latin phrases, and Blackstone has added brief English versions, together with cations. These are:

Great golden maiden-hair, or Goldilocks. On Hampstead Heath and Harefield Common plentifully [*Polytrichum commune*].
Boggy earth-moss. On Harefield Common and the bogs on Hampstead Heath [*Sphagnum palustre*].
Triangular water-moss. In Harefield River plentifully [*Fontinalis antipyretica*].

After this modest beginning almost nothing was heard of mosses in the area for nearly a ntury and a half, until Benbow's papers were published. Then it was another thirty years efore the next significant contribution was made, with the publication by Paul Richards 928) of *Ecological notes on the bryophytes of Middlesex*. This comprehensive study was ased on records made from 1920–7, many of them from the Ruislip and Harefield districts. ichards knew Benbow's name (it occurs in his notes relating to *Dicranum montanum* and *. flagellare*), but was not aware of the extent of his work.

Richards's survey took place on the brink of major habitat upheavals, but some features ust have changed only slightly since the beginning of the century. The canal remained naltered, motor traffic was minimal, London's smoke pall still hung over Middlesex. owever, already during the 1920s part of Copse Wood at Ruislip had been cleared to ake way for housing development with, as he observed 'very harmful results to the rrounding vegetation'. Bryophytes newly-recorded for the area were:

Sphagnum compactum
Dicranum bonjeanii
Bartramia pomiformis
Philonotis fontana
Plagiothecium latebricola
Isopterygium elegans
Hypnum jutlandicum
Nardia scalaris

His record of *Polytrichum commune* was the first in the area since Blackstone's in the id eighteenth century. At Ruislip he also first recorded *Fissidens adianthoides,* Benbow's arefield finds so named having since proved to be *F. cristatus*.

Few species were added during the fifty years following Richards's survey. In 1937 F. E. ilsom (1886–1945) found *Dicranum tauricum*, new to Middlesex, at Ruislip (British ryological Society 1938) — an indication of the advance through Britain of this alien oss, rare until the 1930s. In 1949 Francis Rose and Ronald Boniface (1913–85) found *icranum majus* in Park Wood, Ruislip (Crundwell 1969), also new to Middlesex, and ince found in the area only by Colin Bowlt in the early 1960s (Gardiner and Bowlt 1983).

From this time up to 1963 Boniface made a notable series of finds around Ruislip and arefield, reported by Kent (1975). These include the following species:

Fissidens cristatus
Pleuridium subulatum
Weissia longifolia
Schistidium apocarpum
Plagiomnium rostratum
Aulacomnium palustre
Bartramia pomiformis
Thuidium philibertii
Brachythecium glareosum
B. rivulare
Eurhynchium schleicheri
Lophozia ventricosa

Schistidium apocarpum, Brachythecium rivulare and *Lophozia ventricosa* appear to have been newly recorded in the area, while others show continuation of scarce species during his time. *Fissidens cristatus* was not included in the Census Catalogue as a vice-county record.

Patricia Moxey (1965) published a study of the bryophytes of Ruislip Local Nature Reserve. These included *Fissidens exilis*, new to the area.

Introducing the 'Bryophyta' section of *The historical flora of Middlesex*, in which previous records are summarized, D. H. Kent comments:

> 'In the last thirty years there is little doubt that, apart from the investigations of R. A. Boniface, this group of plants has been seriously neglected in the vice-county by bryologists . . . The account which follows is consequently very incomplete, and many species referred to as rare may prove to be locally common, while others which are thought to be possibly extinct are likely to be rediscovered. Despite, however, the inadequacies of the list it will be seen that many species have been recorded for the vice-county, and I hope that it may stimulate renewed interest in these plants in their metropolitan habitats.'

In response Jack Gardiner (1905–89), having recently completed his bryophyte flora of Surrey, embarked on a survey of Middlesex with the intention of updating the material in Kent's *Flora*. In March 1982 he wrote to Kent: 'During the past year I have visited much of the vice-county and started to assemble bryophyte records'. At the same time he had, with Monica Milnes-Smith and Colin Bowlt, been engaged since 1979 on a detailed study of the Ruislip woods area. The resulting paper, *A survey of the bryophytes of Ruislip woods* (Gardiner and Bowlt 1983), was published by the Ruislip and District Natural History Society. In this, over a hundred species were recorded, of which eight were additions to the vice-county census catalogue. The following were new to north-west Middlesex:

Ditrichum cylindricum
Dicranella schreberana
D. staphylina
Campylopus introflexus
Fissidens viridulus
Pottia bryoides
Barbula sinuosa
Pohlia lescuriana
Bryum dunense
B. tenuisetum
Plagiothecium curvifolium
P. succulentum
Calypogeia arguta
Scapania undulata
Conocephalum conicum

On visits to Harefield, Gardiner added *Fissidens pusillus* var. *tenuifolius* and *Lophozia perssonii,* both also additions to the census catalogue.

As regards the project which was to cover the county as whole, Gardiner wrote to Kent in January 1984, reporting that the western half of Middlesex had been fairly well worked but that there was still quite a lot to do in the eastern half, including Hampstead Heath. He reckoned that it would take another year to complete the work. Sadly, illness was soon to strike and his plan remained unfulfilled.

Since 1992 Elinor Wiltshire has been following in Benbow's footsteps, searching for today's bryophytes in what remains of his habitats. As previous recorders have found, while there may be no trace of some once-common species, others turn up which are new to the area. In the latter category are the following:

Poytrichum longisetum
Octodiceras fontanum
Tortula intermedia
T. marginata
Bryum subelegans
B. pseudotriquetrum
  var. *pseudotriquetrum*
B. gemmiferum
B. ruderale
Orthotrichum pulchellum
Ulota crispa var. *crispa*
U. crispa var. *norvegica*
Cryphaea heteromalla
Riccia cavernosa

Several of these are new to the vice-county census catalogue, or renewals of old records

In the catalogue of Benbow's herbarium which follows, records made by Richards, Gardiner and Wiltshire within the same general territory are indicated, revealing a numbe of species apparently not refound since his time. Exceptions are *Brachythecium glareosum* and *Eurhynchium schleicheri,* which were recorded by Boniface, as reported by Kent (1975)

Chalk-loving mosses such as *Encalypta vulgaris, Pottia lanceolata, Leucodon sciuroides, Anomodon viticulosus, Campylium calcareum, Cirriphyllum crassinervium* and *Rhynchostegium megapolitanum* are among the principal casualties, their habitats having been largely destroyed. Wetland mosses, including *Pohlia wahlenbergii, Climacium dendroides, Amblystegium varium, Drepanocladus fluitans, Hygrohypnum luridum* and *Eurhynchium speciosum*, have suffered equally for the same reason. However several of these species were already rated 'very rare' by Benbow. Wall-growing mosses, such as *Gyroweisia tenuis, Barbula revoluta, Bryum radiculosum* and *Rhynchostegium murale*, have also been depleted due to the scarcity of exposed mortar and rough stonework in the area.

Apart from habitat destruction, the main cause of general decline in bryophyte species and populations has been atmospheric pollution, due in particular to sulphur dioxide generated by combustion of fossil fuels. Clean Air Acts in 1956 and 1968, followed by the introduction of natural gas, have resulted in reduction of such pollution in the London area. The beneficial effects on epiphytic mosses are already becoming apparent (Adams and Preston 1992). In north-west Middlesex this is demonstrated by the reappearance of *Orthotrichum lyellii, O. affine* and *Frullania dilatata*, while *O. pulchellum*, both varieties of *Ulota crispa*, and *Cryphaea heteromalla* have been recorded here for the first time. However pollution from other sources, especially road traffic, continues to increase.

Drying-out of habitats has been another damaging factor. Gardiner and Bowlt (1983) pointed out that at Ruislip there had been 'a general fall in the water-table owing to drainage and the extraction of water for industrial and domestic purposes' which would have an adverse effect on bryophyte populations. In addition local records show that rainfall in the Ruislip woods area was distinctly lower during the 1970s and 1980s than during the two previous decades (Winchester and Hawksworth 1991). From whichever cause, the damp hollows in Poor's Field, where *Aulacomnium palustre* was found by Benbow, Richards 'so abundant as to make conspicuous yellowish-green patches in the dull green turf') and Gardiner ('rare'), are now dry and overgrown. A similar fate has overtaken the *Sphagnum* sites and these mosses appear to have vanished from the area.

Habitats

Atmospheric pollution and acid rain, drainage, housing and road development, erosion of woods and reduction of coppicing, traffic, chalk-quarrying, canal-widening, hedge-cutting, ubbish-dumping, and the spread of golf-courses — all these have contributed to the mpoverishment or destruction of Benbow's habitats. Today some protection is provided by the network of nature conservation areas designated by the London Borough of Hillingdon London Ecology Unit 1988). A coppicing regime has been reintroduced in Ruislip woods. Voluntary bodies, such as the London Wildlife Trust, Ruislip and District Natural History Society, the Herts. and Middlesex Wildlife Trust, and Hillingdon Natural History Society, actively care for a series of nature reserves. Although some of these, such as Tarleton's Lake and Dew's Farm reserves, are very small, each harbours species rare or absent elsewhere n the area.

Despite the depredations of the past century, most of Benbow's sites can still be identified, n however reduced or altered forms (Figure 2). The principal ones are:

1. Uxbridge Common and Fray's Meadows
2. Ruislip woods, Poor's Field and Reservoir (Lido)
3. Harefield: Old Park Wood, Coppermill Down, chalk-pit
4. Springwell chalk quarry
5. Grand Union Canal from Denham Lock to Springwell Lock
6. Swakeleys: Park Wood and lake

1. UXBRIDGE

Uxbridge Common was still a good habitat at the end of the last century. Benbow collected a variety of mosses there, among them *Racomitrium elongatum* (known to him as *R. canescens*), not since recorded in Middlesex and unusual in lowland Britain. But even then the area was being eroded. 'Many plants once abounding in several parts of this old Common have now disappeared under the plough', he comments in a notebook. Today it is further reduced by motorway expansion, and what remains is mainly dedicated to sports facilities Only a 24-hectare sector, comprising old meadows, trees, scrub, hedges, ditches and stretch of the River Pinn, has been reserved as a conservation site.

Just north of Uxbridge, along Fray's River, are Fray's Farm Meadows, a Site of Special Scientific Interest (without public access). This remnant of wet alluvial grassland provided Benbow with a range of characteristic species, including *Climacium dendroides Amblystegium varium* and *Eurhynchium speciosum*, of which there have been no Middlesex records during recent decades.

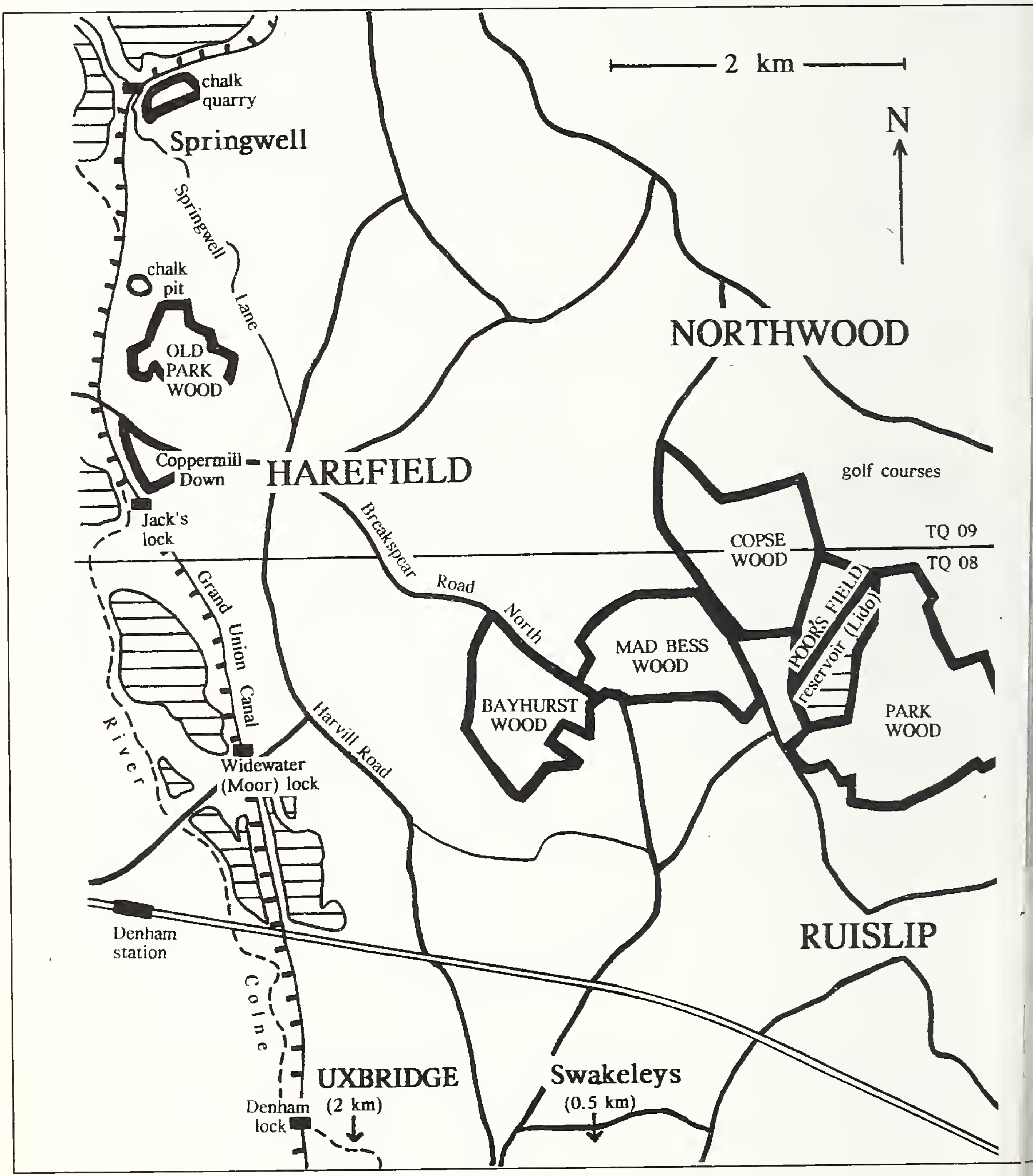


FIGURE 2. Simplified map showing location of main sites referred to in this paper.

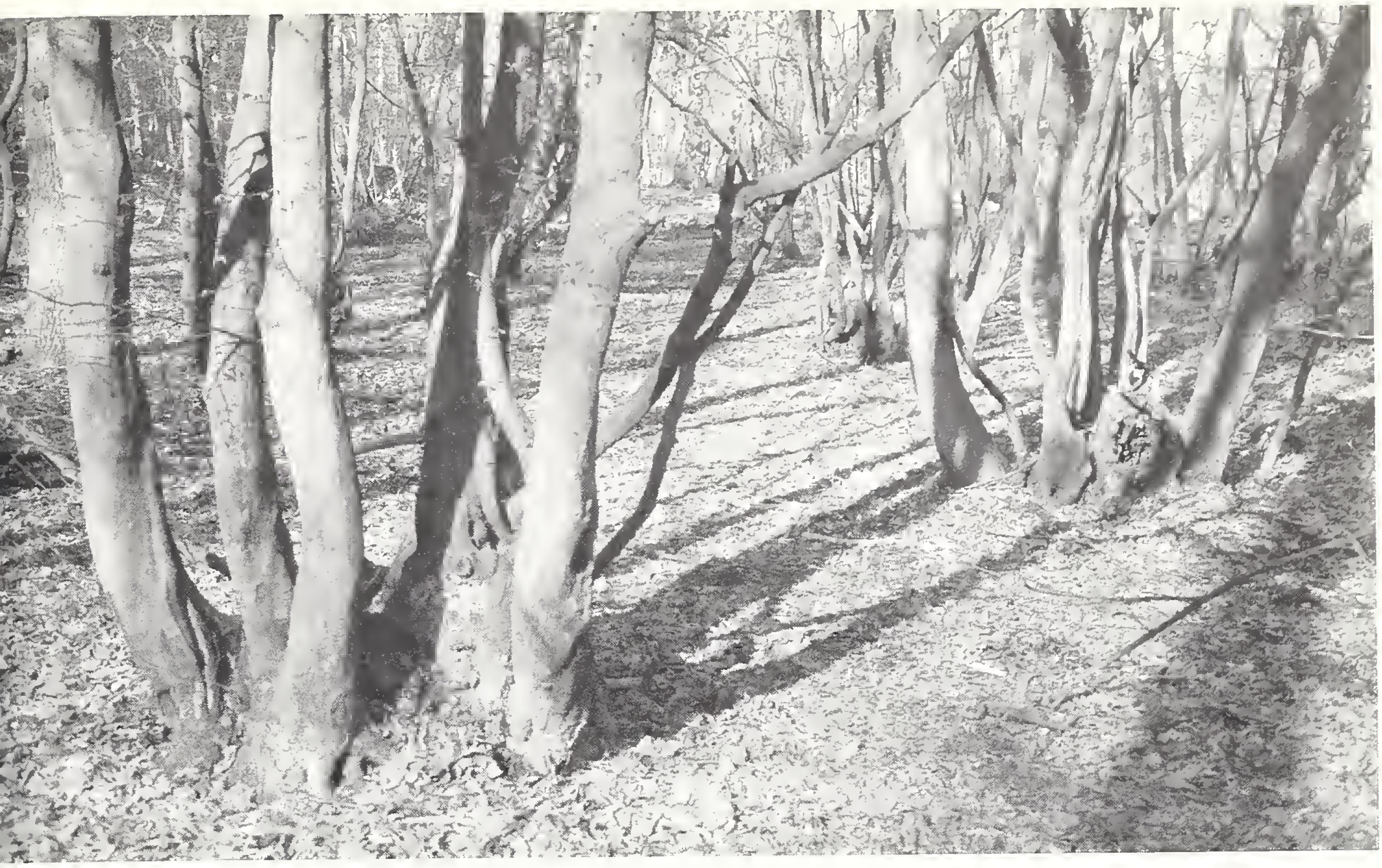
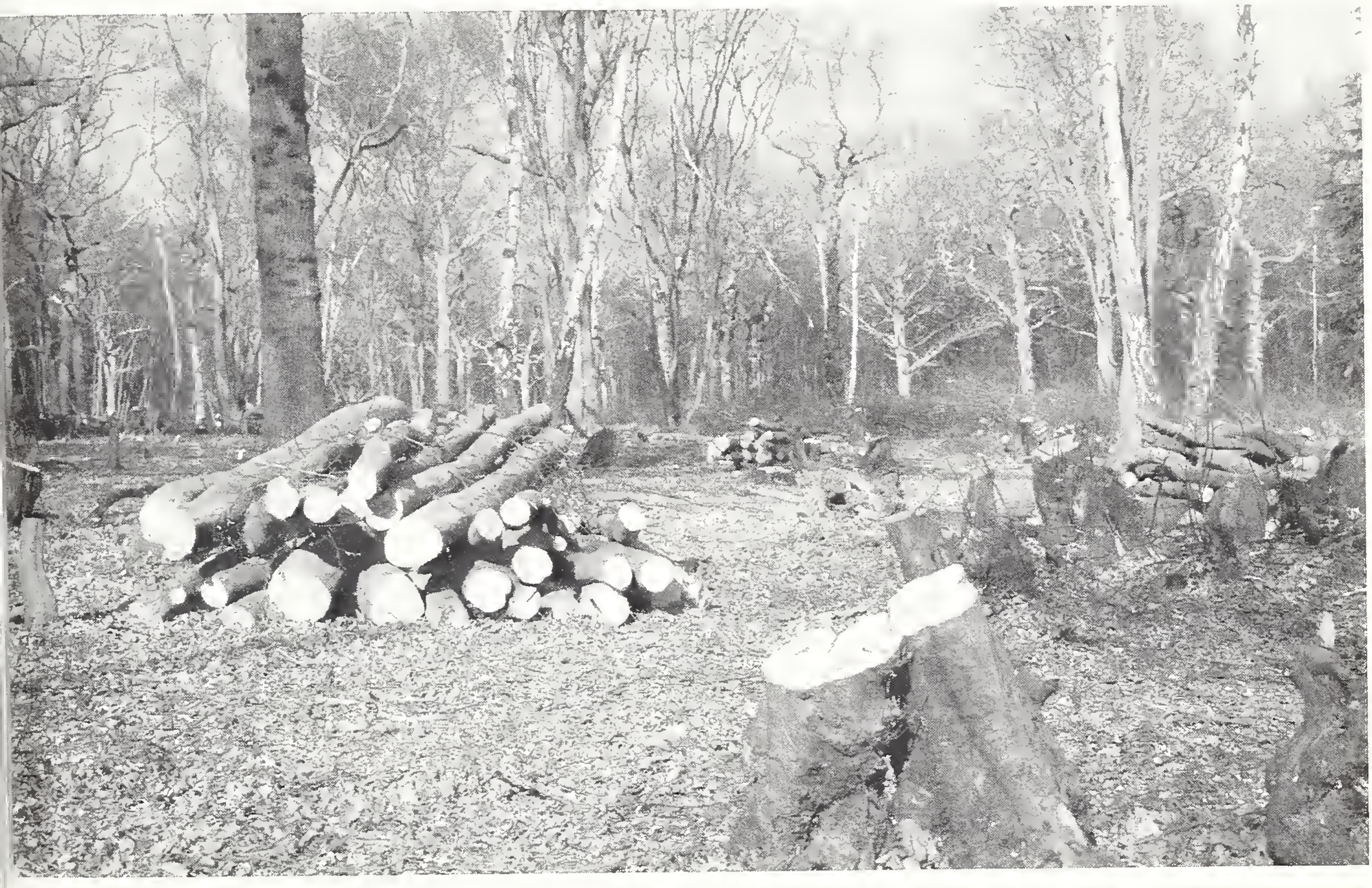


FIGURE 3. Copse Wood, Ruislip before coppicing.



IGURE 4. Copse Wood, Ruislip after coppicing.

. RUISLIP

Ruislip Woods, a 291-hectare complex comprising four separate stretches of woodland nd the common known as Poor's Field, is a Site of Special Scientific Interest. The woods – Park, Copse, Mad Bess and Bayhurst — have a long history, being remnants of forest ecorded in the Domesday survey of 1086. The trees are predominantly oak and hornbeam, nd were traditionally managed by means of coppicing, which incidentally favoured the rowth of bryophytes (Figures 3 and 4). Richards (1928) observes: 'The old coppiced tumps of hornbeam in particular are thickly covered with moss.' About the middle of the resent century economic changes brought an end to coppicing and the woods began to deteriorate, but in recent years a management plan including coppicing was put into operation by Hillingdon Council. In the new clearings species are regenerating — during 1994 there was striking growth of *Dicranum scoparium* in Copse Wood, and even a few plants of *Polytrichum longisetum*, very rarely seen in Middlesex.

There are several small streams and damp ditches in the woods, whose banks support a range of liverworts. Although the bryophyte population today is surprisingly varied for a site in the London area, it is obviously much depleted since Benbow's time. An example is *Isothecium myurum*, which for him was 'frequent'. Richards found it, but it has not been recorded here since the 1920s.

Poor's Field, formerly common pasturage, now mainly rough grass with invasive scrub, includes a heathy area with clumps of *Calluna vulgaris*. These harbour a variety of mosses, including *Dicranum bonjeanii* and *Pleurozium schreberi*, and there is a pathside colony of *Polytrichum piliferum*. Gardiner found *Calliergon cordifolium*, rare in Middlesex, in a ditch here.

Ruislip Woods SSSI surrounds the reservoir but does not include it. Since the 1930s it has been a recreational area with artificial beach known as the Lido, but stretches of the low shore-line sustain a varied flora including interesting bryophytes. The rare liverwort *Riccia cavernosa* appeared there in 1993, a new Middlesex record.

3. HAREFIELD

The chalk outcrops along the narrow ridge by the valley of the River Colne have provided Middlesex with unique botanical records, but over a long period commercial exploitation has brought about their almost total destruction. Nevertheless around Harefield there are still habitats of outstanding interest, among them Coppermill Down, a fragment of chalk grassland designated a Site of Metropolitan Importance. Here Benbow found the uncommon moss *Fisssidens cristatus* (known to him as *F. adianthoides)*, which is still present. He also used to visit Old Park Wood, now a SSSI part-owned and managed by the Herts. and Middlesex Wildlife Trust. It can be entered from the grounds of Harefield Hospital.

The large chalk-pit at the end of Summerhouse Lane was once a fruitful source of unusua mosses and other plants, but most of these were swept away in the course of converting the site for use as a rifle range.

4. SPRINGWELL

At Springwell, chalk-quarrying, which continued until recent times, has left an extensive area of devastation, in part used as a refuse dump. In Benbow's time the Middlesex part o Garret Wood occupied the northern end of the site, and for him this was a good source o chalk-loving mosses which are no longer to be found in north-west Middlesex. During the 1940s it was cleared to allow extraction of the underlying chalk and now no trace remain either of the wood or of any original vegetation.

The southern part of the quarry has so far fared better. In places on the moist floo *Dicranella varia, Pellia endiviifolia* and *Leiocolea turbinata* are prolific, while *Seligeria paucifolia* and *S. calcarea* cling to chalk cliffs and boulders. It would seem to be an idea site for conservation, but public access now is prohibited.

5. GRAND UNION CANAL (formerly Grand Junction Canal)

The 6-km stretch of canal from Denham Lock to Springwell Lock provided Benbow with a different range of bryophytes. As well as species associated with water, such as *Fissidens crassipes*, there was an assortment of *Barbula, Bryum* and other mosses on th stonework of locks and along the banks. At that time the latter must have provided a more favourable environment than today's. During the 1930s the canal was widened, the bank were lined with steel piling and concrete, and edged with steel rails. Countless pleasure boats now disturb and pollute its waters. However the riparian moss *Scleropodium cespitan* n occasionally be found here, and in 1994 the rare *Octodiceras fontanum*, which grows ıder water, was discovered attached to the stonework of both Widewater and Jack's Locks.

SWAKELEYS

Swakeleys is now severed from Uxbridge Common by the Western Avenue (M40) otorway but it would have been on Benbow's walking route to Ruislip. By the lake, by a vatersplash' below the lake, and by a brook in Park Wood, he found such mosses as *'imacium dendroides, Leskea polycarpa, Amblystegium varium, Hygrohypnum luridum*, ıd *Euhynchium speciosum*, all rare and now mostly absent from Middlesex. Today the atersplash and brook have vanished, and Park Wood is only a remnant of secondary owth. The lake remains, but appears polluted and neglected.

Benbow's bryophyte herbarium

1902, when he was 81, Benbow set out to arrange his bryophyte collection. He had some)0 specimens from his own area, representing 147 moss and 19 liverwort species, ıbspecies and varieties. In addition there was material which he had collected in eighbouring Bucks. and in North Wales, and some contributed by his sons and fellow ryologists. For presentation of the full range of species he prepared three albums. Each oecimen had previously been glued on to stiff paper (often an old envelope) with ccompanying notes, and these were attached to the album pages. These albums have now een dismantled, and the specimens are incorporated in the Cryptogamic Herbarium of he Natural History Museum, the north-west Middlesex material having been catalogued. uplicate specimens and unidentified liverworts from Wales have been returned to store.

In his published papers Benbow reported only those species which were not in Trimen ıd Dyer (1869), and were therefore new to Middlesex (he apparently overlooked his ecord of *Cirriphyllum piliferum*). However in his *Flora* his bryophyte finds are listed in ıll, with notes on sites and frequency. All the species mentioned in this list are represented ı his herbarium with the exception of *Scleropodium cespitans, Pleurozium schreberi* and *'hiloscyphus polyanthos*. Surprisingly, he does not seem to have found *Dicranum bonjeanii* r *Isopterygium elegans*.

Comparison of herbarium specimens with the records published by Benbow (1894–9) in ıe *Journal of Botany* has revealed a few errors, discrepancies and repetitions. These are etailed as follows:

eligeria pusilla: 3 specimens—all are *S. paucifolia* (**32**: 369).
)icranella rufescens: 2 specimens—both are *D. varia* (**32**:106).
)icranum montanum: published twice (**32**: 369 and **37**:441).
). flagellare: published twice (**32**: 107 and **37**: 441).
'issidens viridulus: 4 specimens were so labelled—two are *F. incurvus*, one is *F. bryoides* and one is possibly *F. viridulus* **32**: 369).
'ottia intermedia: published twice (**32**: 370 and **37**: 441), the latter as *P. littoralis*.
'ymnostomum aeruginosum: published as *G. rupestre*—specimen is *Barbula cylindrica* (**34**: 400).
'ryum turbinatum: doubtful—specimens now indeterminable (**32**: 370).
. algovicum: doubtful—specimens now indeterminable (**32**: 370).
. argenteum var. *lanatum*: specimens doubtful (**32**: 370).
. pseudotriquetrum var. *bimum*: published twice as *B. bimum* (**32**: 107 and **34**: 40), the latter as var. *cuspidatum*.
ygodon viridissimus: published twice (**32**: 107 and 370), the latter as var. *rupestris*.
'huidium philibertii: published in error as *T. recognitum* (**32**: 370).
mblystegium varium: published as *A. radicale* (**32**: 370) but corrected in his *Flora* to *A. varium*.
'repanocladus fluitans: published as *Hypnum exannulatum* (**32**: 107) but corrected in his *Flora*: 'Mr. H. N. Dixon says they are *H. fluitans*'.
rachythecium salebrosum: error (**32**: 107)—one specimen is *B. mildeanum* and the others are *Isothecium myosuroides*.

Conclusion

John Benbow published only those of his bryophyte records which were new to Middlesex. Although these amounted in all to some 65 species it was not until his herbarium was examined that the full extent of his investigations became apparent. He recorded every common species in his area with the same meticulous care that he devoted to rarities, thus leaving us an exact picture of bryophyte populations there a century ago.

With this subsequent records can be compared. About a dozen of Benbow's species seen by Richards during the 1920s have not been recorded since, nor have several others noted by Boniface in 1950s. Over 50 Benbow records were not renewed in the period 1979–95. On the other hand, 26 species not seen by Benbow were recorded by Gardiner and his colleagues, and a further 14 by Wiltshire. Several of these are species which have been described since Benbow's day, or which have spread through Britain only during recent decades.

Such comparisons are dependent on survival of the habitats concerned. In a county dominated by the sprawl of Greater London, it is remarkable that so many of Benbow's sites are still to be found and still productive of interesting bryophytes. Our gratitude is due to all those concerned with their protection and conservation.

The north-west Middlesex bryophyte collection of John Benbow in the Cryptogamic Herbarium of The Natural History Museum (BM)

Subsequent records of each species made in the area by P. W. Richards, 1920–7, J. C Gardiner with M. Milnes-Smith and C. Bowlt, 1979–83, and E. Wiltshire, 1992–5, are shown in the left-hand margin by the initials R, G and W.

The initials 'J. E. B.' throughout these notes indicate confirmation by J. E. Bagnall. Moor Lock is now known as Widewater Lock, and Ruislip Common as Poor's Field.

MOSSES

R *Sphagnum palustre*. Ruislip woods, May 1892.

RG *S. auriculatum*. Duck Wood, 2.ii.1892; Harefield Common, 30.iv.1892; Ruislip woods 28.xii.1892.

S. cuspidatum. Canal side between Denham and Moor Locks, 10.v.1893.

RGW *Tetraphis pellucida*. Copse by Uxbridge Common, 14.v.1892.

RGW *Polytrichum formosum*. Copse below Uxbridge Common, June 1886; Ruislip woods 30.iv.1892, 5.iv.1895 [2 specimens tentatively misnamed *P. gracile*], 22.v.1895.

RGW *P. piliferum*. Uxbridge Common, April 1886, 19.xi.1891.

RGW *P. juniperinum*. Uxbridge Common, June 1886, 28.v.1892, 21.vi.1892.

R *Pogonatum nanum*. Gravel-pit in the wood by Clarke's Lodge, Uxbridge Common, 19.xi.1891 copse by Uxbridge Common, 4.xii.1891, Ruislip woods and Common, 16.ii.1899.

P. aloides. Near Uxbridge, December 1891.

RGW *Atrichum undulatum*. Ruislip woods, 28.ix.1892, 'with some seta aggregate'; copse below Uxbridge Common, 30.ix.1892; Garret Wood, Springwell, 16.xii.1893; copse by Uxbridge Common, 21.xii.1894.

Archidium alternifolium. Muddy bottom of Ruislip Reservoir, 21.x.1892; margin of Ruislip Reservoir, 21.x.1892; hill meadows between Ruislip Reservoir and Eastcote, 8.iii.1894.

RG *Pleuridium acuminatum*. Uxbridge Common, March 1886, 10.iv.1886; Hillingdon Heath April 1886; Uxbridge, May 1886; Ruislip woods, sides of watercourse, 1.iv.1892, 12.iv.189 Duck's Hill Heath, 24.ii.1894, Ruislip woods, 24.ii.1894.

R *P. subulatum*. Old sandpits, Northwood, 24.iv.1893 [2 specimens marked 'Yes—J. E. Bagnall'

GW *Pseudephemerum nitidum.* On muddy bottom of Ruislip Reservoir, 30.iii.1893 'very abundant'; on decaying tree-stumps, Fray's Meadows, Uxbridge, 25.iv.1893, 28.iv.1893, 'Mr. J. E. Bagnall writes: "Seems a state of *Pleuridium axillare*—I notice numerous tuberous buds at base of stem—these are reserves of plant-food I think" '; on muddy bottom of Ruislip Reservoir, 7.xi.1893; Ruislip Reservoir, 26.xii.1893; Ruislip woods, 26.xii.1893.

G *Seligeria paucifolia.* Old chalk-pit, Harefield Park, 29.i.1891, 5.v.1894, 5.vi.1894 [all these specimens were misnamed *S. pusilla* and published as such in *J. Bot.* **32**: 369].

RGW *S. calcarea.* Chalk cliffs in great chalk-pit, Harefield, 9.ix.1893; face of chalk cliffs, 9.ix.1893 'J. E. B.'; great chalk cliffs, Harefield, 5.x.1893.

RGW *Ceratodon purpureus.* Uxbridge, April 1886; near Uxbridge Common, April 1886; my garden, Uxbridge Common, May 1886; old walls near Harefield church, 4.iv.1893 'with Ivo'; Ruislip Common, 1.ii.1893 'with Capt. J. E. B.'; sand-pits in waste ground at Northwood, 24.iv.1893; Fray's Meadows, 29.x.1893 'a curious form'; near Eastcote, 3.iv.1894, 5.iv.1894 'with leaves short and rounded and very obtuse at apex, resembling *Trichostomum tophaceum*'.

R W *Dicranella varia.* Chalk-pit, Springwell, 10.x.1893 [2 specimens, one marked 'var. *tenellum*—J. E. B.', the other 'J. E. B.'], 16.xii.1893; chalk-pit, Harefield, 21.xi.1893 'near var. *callistoma*—J. E. Bagnall'; Harefield chalk-pit, 19.x.1893 and Springwell chalk-pit, 16.xii.1893 [both these were misnamed *D. rufescens* and published as such in *J. Bot.* **32**: 106].

RGW *D. heteromalla.* Ruislip woods, 19.x.1892.

RGW *Dicranoweisia cirrata* On trees in Swakeleys, 29.xi.1892, 11.i.1893, 12.ii.1893 'with Capt. J. E. B.'; walls, Ruislip, 19.ii.1893, 8.iii.1893; on rails in the lane from Highway Farm to Bayhurst Wood, 7.ii.1894.

RGW *Dicranum scoparium.* Ruislip woods, 18.iv.1892, 2.vii.1892, 28.ix.1892, 5.xi.1892, November, 1892.

RGW *D. montanum.* On a tree in the lane from Highway Farm to Bayhurst Wood, growing with *Zygodon viridissimus*, etc., 27.i.1894 'new record for Middlesex and southern counties'; SE corner of Duck Wood, by Ruislip Reservoir, 14.ii.1899 'in plenty' [3 specimens].

RGW *D. flagellare.* Ruislip woods, 18.iv.1892 'This specimen was sent to Dr. Braithwaite, author of *British Moss Flora*, for his herbarium at his request—*very rare* (fide Mr J. E. Bagnall)—new record for Middlesex and 2nd for Great Britain'; Ruislip woods, 18.iv.1892; Park Wood, E side of Ruislip Reservoir, 23.i.1894 'abundant' [3 specimens], 10.ii.1894 'with Ivo', 8.iii.1894, 21.iii.1895 'part given to Mr J. E. Bagnall', 2.iv.1896 [2 specimens].

RG *Campylopus pyriformis.* Duck's Hill Heath, 28.xii.1891; Ruislip woods, 26.xii.1893, 24.ii.1894; Park Wood, E side of Ruislip Reservoir, 7.ii.1894, 5.iii.1894.

RGW *C. paradoxus.* Ruislip woods, 26.xii.1893 [2specimens]; Park Wood, E side of Ruislip Reservoir, 23.i.1894 [6 specimens]; Bayhurst Wood, 7.ii.1894 [2 specimen].

GW *Leucobryum glaucum.* Ruislip woods, Northwood end, 8.iii.1899 '78th birthday'.

G *Fissidens viridulus.* Lane from Jack's Lock to Harefield 29.i.1894 [doubtful specimen].

RG *F. incurvus.* Lane by Highway Farm to Bayhurst Wood, 27.i.1894 'Yes—J. E. B.' [2 specimens, both misnamed *F. viridulus* and published as such in *J. Bot.* **32**: 369]; by Bayhurst Wood, 7.ii.1894;about Eastcote and Ruislip, 5.iii.1894; lane by Highway Farm, 24.iii.1894.

RGW *F. bryoides.* Near Uxbridge Common, March 1886; wood by Uxbridge Common, 16.i.1894; lane by Bayhurst Wood, 7.ii.1894; near Harefield, 4.i.1895 [misnamed *F. viridulus*].

R *F. crassipes.* Sluice, Horse-shoe Bay, Jack's Lock, Harefield, 5.v.1894, 12.v.1894, 29.ix.1894.

RGW *F. taxifolius.* Copse by Uxbridge Common, April 1886; Ickenham Road, lane below Uxbridge Common, April 1886; Ickenham Road, 21.i.1891.

R W *F. cristatus.* On downs between Jack's Lock and Copper Mills, Harefield, 19.x.1893; chalk downs, Harefield, 12.i.1894, 29.i.1894 [misnamed *F. adianthoides*].

Encalypta vulgaris. Garret Wood, 25.iii.1893 [2 specimens], 2.x.1893.

W *Tortula ruralis.* Above the chalk cliffs, Harefield, 1.iii.1893.

R *T. laevipila.* Uxbridge, April 1886; Harefield Park, 30.iii.1891; Fray's Meadows, 23.iv.1893 'with H. B. Bird'.

RGW *T. muralis*. Uxbridge, April 1886. May 1886; canal side between Denham and Moor locks, 4.vi.1892 '? var. *rupestris*'; brickwork of road-bridge, N end of Ruislip Common, 9.v.1892.

W *T. subulata*. Between Highway Farm and Harefield, by turn to Breakspear's, 7.ii.1893; 23.x.1893. growing with *Rhynchostegium megapolitanum* on sandy bank between Highway Farm and Harefield, 24.iii.1894.

T. papillosa. Copse between Jack's Lock and Harefield, 22.vii.1895; by pit near Dew's Farm, 10.ii.1896 [2 specimens].

GW *T. latifolia*. On whitethorn stumps, Fray's Meadows. 10.iv.1892; on roots by the brook in Park Wood. Swakeleys, 20.ii.1894; brook between Ruislip and Ickenham, 2.iii.1896; on posts of plank bridge at watersplash, Ickenham Green, 8.xii.1898.

G *Aloina rigida*. Below chalk cliff, Harefield, 19.x.1893 'J. E. B.' [2 specimens]; below the great chalk-pit, Harefield, 12.i.1894.

GW *A. aloides* var. *aloides*. Above the chalk-pit, Harefield, 21.xi.1893 [2 specimens].

RG *A. aloides* var. *ambigua*. Chalk-pit, Harefield, 25.iii.1893; field above chalk cliffs, Harefield, 29.i.1894 'abundant—J. E. B.'.

R *Pottia starkeana* ssp. *minutula*. Chalk downs, Harefield, 12.i.1894 'with Herbert and Leonard'; downs by Jack's Lock, Harefield, 2.iii.1894; top of chalk-pit, Harefield, 27.xii.1894 'with H. C. and W. L. Benbow'.

P. lanceolata. Above chalk cliffs, Harefield, 13.i.1896.

W *P. intermedia*. Chalk downs, Harefield, 1.ii.1894 'Yes—J. E. B.'; downs by Jack's Lock, 2.iii.1894 'Yes—J. E. B.'; downs above Jack's Lock and Copper Mills, Harefield, 2.iii.1894 'Yes—J. E. B.'.

P. intermedia var. *littoralis* (?). On stump of old tree, Fray's Meadows, Uxbridge, 11.viii.1894 'Mr J. E. Bagnall and Mr H. N. Dixon have never seen a *Pottia* resembling this—Dixon thinks it must be a form of *P. littoralis*—it is, they write me, a most curious form—J. B.'.

RGW *P. truncata*. Uxbridge Common, 8.iii.1886; hedgebanks, Ruislip, 1.iv.1892; Pield Heath, Hillingdon, 27.x.1893; dried bed of Ruislip Reservoir, 7.xi.1893; bank below copse towards Swakeleys Lake, 28.xi.1893; Ruislip and Eastcote, 5.iii.1894.

R W *Phascum cuspidatum*. Canal bank near Denham Lock, May 1886; Ruislip woods 26.xii.1893; Harefield downs above Jack's Lock, 12.i.1894; lane by Highway Farm, 27.i.1894; roadside between Uxbridge and Harefield, 7.ii.1894 'also by Bayhurst Wood and other places'; downs by Jack's Lock, 2.iii.1894; bank between copse below Uxbridge Common and Swakeleys Lake, 20.iii.1894.

R *Acaulon muticum*. Duck's Hill Heath, 26.xii.1893.

RGW *Barbula convoluta*. Canal walls between Denham and Moor Locks, 18.v.1892, 20.iii.1893; canal walls near Harefield Moor, 30.iii.1893; roadside by Old Park Wood, 20.iii.1893 [mixed species].

RGW *B. unguiculata*. Canal walls, Cowley Peachey, 8.xii.1892; canal side, Denham to Moor Locks, 27.i.1893; canal walls, 10.iii.1893; top of great chalk-pit, Harefield, 25.iii.1893; old chalk-pit, Harefield, on bare chalk, 25.iii.1893.

GW *B. hornschuchiana*. Canal walls between Denham and Moor Locks, 8.iii.1895; by the horse bridge at Broadwater, near Harefield, 13.v.1896.

B. revoluta. Old wall at King's End, Ruislip, 1.ii.1893 'with Capt. J. E. B.'; walls in Ruislip, 8.iii.1893; canal walls between Denham Lock and Harefield, 10.iii.1893; walls of The Cedars, Hillingdon, 15.iii.1894 [with *B. fallax*].

GW *B. fallax*. Canal wall between Denham and Moor Locks, 16.iv.1893 'a most amazing mistake of Mr J. E. Bagnall—named *unguiculata, vinealis* and *fallax* at 3 different intervals by Mr J. E. Bagnall!!—really *fallax*' [this specimen contains a mixture of species]; Garret Wood, 25.iii.1895.

W *B. trifaria*. Garret Wood, 23.iv.1892 'a small form abundant on the chalk' [misnamed *B. fallax*]; old chalk-pit in Harefield Park, 5.v.1894 [2 specimens]; old chalk-pit in the meadows between Harefield brickfield and Jack's Lock, 2.xii.1895 'in young fruit'; old chalk-pit, Harefield, 2.iii.1896 'Yes—J. E. Bagnall'.

W *B. tophacea*. Canal side between Denham and Moor Locks, 16.iv.1892, 10.iii.1893 [2 specimens, one marked 'Yes—J. E. B.'], 16.iv.1893 [2 specimens, one named *B. unguiculata* 'unlike the type—J. E. Bagnall']; old chalk-pit in Harefield Park, 5.v.1896.

GW *B. vinealis*. Near Harefield, 5.v.1894; old chalk-pit in Harefield Park, 5.v.1894; wall in front of Swakeleys lodge, Uxbridge Common 10.ii.1896.

GW *B. cylindrica*. Hedgebank roadside below Harefield Hill, 30.xii.1893 'J. E. B.'; copse between Jack's Lock and Harefield, 29.i.1894 [misnamed *Weissia rupestris* and published as *Gynostomum rupestre* in *J.Bot.* **34**: 400]; canal banks between Denham and Moor Locks, 8.iii.1895 [2 specimens, both misnamed *B. fallax* and initialled 'J. E. B.']; canal walls between Denham and Moor Locks, 25.iii.1895 [2 specimens, both misnamed *B. fallax*]; Garret Wood, 25.iii.1895.

RGW *Bryoerythrophyllum recurvirostrum*. On bare chalk, Garret Wood, 25.iii.1893; old chalk-pit in Harefield Park 10.xii.1895 'with young fruit'; old chalk-pit in Harefield Park, 29.i.1896.

Gyroweisia tenuis. Wall of small tumbling-bay between Denham and Moor Locks, 8.v.1893,18.v.1893, 16.vi.1894, 14.vii.1894; wall of tumbling bay, canal side, 13.vi.1893.

R W *Weissia controversa*. Bank below copse between Uxbridge Common and Swakeleys Lake, 14.xi.1891, 16.iv.1892; banks at Uxbridge, 23.ii.1892.

W. microstoma. Hill meadows between Ruislip Reservoir and Eastcote, 8.iii.1894, 26.iii.1894; meadows above Ruislip Reservoir, 12.iv.1894.

W *W. longifolia* var. *angustifolia*. Chalk downs, Harefield, 29.i.1894; downs between Jack's Lock and Copper Mills, 29.i.1894; downs by Harefield Park, 2.iii.1894; downs by Jack's Lock, 2.iii.1894.

Leptodontium flexifolium. NE angle of Park Wood, E side of Ruislip Reservoir, 8.iii.1894.

RGW *Grimmia pulvinata*. Uxbridge 1886 [3 specimens]; wall of The Larches, Hillingdon, April 1886; on bare chalk, Garret Wood, 25.iii.1893.

Racomitrium elongatum. Uxbridge Common, May 1886, 8.iii.1892 'abundant' [2 specimens, named *R. canescens*].

RGW *Funaria hygrometrica*. Uxbridge, May 1886; cinder heap, Broadwater Farm, Harefield, 18.v.1893.

Physcomitrium pyriforme. Bank, Denham Lock, May 1886 [2 specimens]; Uxbridge Common, May 1891; watersplash, Swakeleys Lake, 27.iv.1893.

RGW *Pohlia nutans*. Copse by Uxbridge Common, May 1886; old sand-pits, Northwood, 28.v.1894.

RGW *P. carnea*. On posts in water by watersplash, Swakeleys Lake, 16.v.1893 'Yes — J. E. B.'.

P. wahlenbergii. Walls, canal banks between Denham and Moor Locks, 18.v.1891 'This specimen was actually named *Bryum eythrocarpum* by Mr A. Gepp, Principal Cryptogamic Assistant of British Natural History Museum, Botanical Department!!! Mr J. E. Bagnall remarks on it — "unlike all that I name so". NB: Mr A. Gepp has never yet named for me a single species correctly!!'; canal walls between Denham and Moor Locks, 8.iii.1893 '72 today'; wet bank beneath Denham Lock, 9.ix.1893, 2.x.1893; canal bank, Denham Lock, 12.i.1894; watersplash, Swakeleys Lake, 27.iv.1894.

R *Bryum pallens*. Old sand-pits, Northwood, 8.vi.1893; Ruislip Reservoir, 6.ix.1893 'a deep-water form — J. E. B.'.

B. turbinatum (?). Canal wall between Denham and Harefield Locks, 18.v.1892, 23.iv.1893 'thought to be *B. pallens* at first by me—not satisfied—sent it to Mr J.E. Bagnall, who named it *B. origanum* (Boswell)—sent it to Mr Boswell, who named it *B. turbinatum*, which no doubt it is' [published in *J. Bot.* **32**:370 as the latter—2 specimens, both lacking sporophytes, are indeterminable].

B. algovicum (?). Hill meadows above Ruislip Reservoir, 26.iii.1894 'Yes, I think—J. E. B.' [published in *J.Bot.* **32**: 370 as *B. pendulum*—2 specimens, both lacking sporophytes, are indeterminable].

B. inclinatum. Copse by Uxbridge Common, May 1886 'synoicous—J. E. B.'; sand-pits, Northwood, 24.iv.1893; old sand-pits, Northwood, 28.v.1894 'synoicous—J. E. B.' [2 specimens].

B. donianum. By Highway Farm, 26.i.1894 'Yes, I think so—J. E. B.'.

RGW *B. capillare.* Near Uxbridge, May 1886 [2 specimens]; wall of Sir W. Byles' garden, Harefield, 8.iii.1892; wall, King's End, Ruislip, 1.iv.1892; Harefield Moor meadows, 5.x.1893.

W *B. pseudotriquetrum* var. *bimum.* Near Uxbridge, April 1886 'This appears to be *Bryum bimum* var. *cuspidatum*—J.E. Bagnall—if so it is the *B. affine* (of Bruch), but I think Bagnall is wrong'; wall of canal between Denham and Moor Locks, 23.iv.1892, 18.v.1892; canal side near Moor Lock, 18.v.1892; canal walls between Denham and Moor Locks, 20.iii.1893 'appears luxuriant *bimum*—J. E. B.'; ditch in Ruislip Common, 7.xi.1893.

RGW *B. caespiticium.* Uxbridge, May 1886 [2 specimens]; on walls of Penclose, Uxbridge, 19.iii.1892; wall by Ickenham church, 27.iii.1892 'with Capt. J. E. B., just returned from India—our first walk'; wall by Ickenham church, 14.v.1893; on banks by Denham Lock, 27.vi.1893 'J. E. B.'.

RGW *B. bicolor.* Copse by Uxbridge Common, May 1886; Uxbridge Common, 30.iii.1892; on the road-bridge NE of Ruislip Common, 9.v.1892; canal walls between Denham and Moor Locks, 10.iii.1893 'barren state—J. E. B.'.

RGW *B. argenteum.* Uxbridge, September 1891; fields about Uxbridge Common, 18.ix.1891; by the Copper Mills, Harefield, 22.ix.1891; wall of meadow between Uxbridge and Honey Hill, 4.xii.1896; my garden, 'Rathaspeck', Uxbridge Common, April 1886; wall of meadow, back of my garden, 23.ix.1892; wall opposite Sir William Stephenson's, Uxbridge Common, 27.x.1892 [the three latter named var. *lanatum*].

B. radiculosum. Canal walls between Denham and Moor Locks, 8.iii.1895, 25.iii.1895.

GW *B. rubens.* Ruislip woods, 6.vi.1895; Uxbridge Common, 20.vi.1895.

RGW *Mnium hornum.* Copse, etc. above Uxbridge Common, April 1886; Ruislip woods, 1.iv.1891; copse by Uxbridge Common, 16.v.1892.

GW *Rhizomnium punctatum.* By side of small watercourse, Mad Bess Wood, Ruislip, 10.ii.1899 'the hottest night and day in February ever recorded—56° lowest at night, 23° above average!'; Ruislip woods, 8.iii.1899 '78th birthday'.

R W *Plagiomnium affine.* Near Uxbridge, 1887; copse near Uxbridge Common, April 1892 [misnamed *P. rostratum*].

RGW *P. undulatum.* Park Wood, Swakeleys, 15.ii.1892 'c. fr'; 20.ii.1892 'with Ivo'; 16.iii.1892; 7.v.1892 'with Capt. Benbow'; 8.iii.1898 'my 77th birthday'.

RG *Aulacomnium palustre.* Swampy place on Ruislip Common, 9.v.1892 'abundant', 19.vi.1892; Ruislip Common, 6.vi.1892.

RGW *A. androgynum.* Uxbridge Common, April 1886; on ground, Turner's nursery, Uxbridge, April 1886; on tree-stumps, Harefield Road, Uxbridge Common, May 1886; Uxbridge, on ground, May 1886; copses about Swakeleys, May 1886; near Harefield, May 1886; hedgebanks about Uxbridge Common, 3.ii.1894.

G *Zygodon viridissimus.* On tree, from Cannon Bridge towards Ruislip, 1.ii.1893 'with Capt. J. E. B.', 8.iii.1893; on willows, Fray's Meadows, Uxbridge, 8.iii.1893; Ruislip woods, 8.iii.1893; Garret Wood, 25.iii.1893; between Highway Farm and Harefield, 18.v.1893; lanes about Bayhurst Wood, 7.ii.1894; old chalk-pit in Harefield Park, 5.v.1894.

W *Orthotrichum lyellii.* Rotten willow trunk by the brook in Park Wood, Swakeleys, 20.ii.1894; on oak tree, Mad Bess Wood, 8.iii.1896 'my 75th birthday' [2 specimens].

GW *O. affine.* Trunks of willows, Fray's Meadows, Uxbridge, May 1886, 18.v.1892; Fray's Meadows, Uxbridge, 11.vii.1894.

RGW *O. diaphanum.* On willows about Uxbridge, May 1886; Fray's Meadows, Uxbridge, 27.vi.1892; lane above Jack's Lock near Harefield, 31.x.1892; copse between Jack's Lock and Harefield, 29.i.1894; old chalk-pit in Harefield Park, 2.iii.1894; lane by Jack's Lock, 20.iii.1894; Fray's Meadows, Uxbridge, 30.iii.1894; on stone coping of small tumbling-bay between Denham and Moor Locks, 18.iii.1895.

RGW *Fontinalis antipyretica.* Horse-shoe tumbling-bay near Jack's Lock, May 1886; small tumbling-bay towpath, canal by bridge beyond Denham Lock, 29.ix.1890; tumbling-bay near Jack's Lock, 12.vii.1891; in the watercourse running through Ruislip woods, 2.ii.1892; pond on Duck's Hill Heath, 18.iv.1892.

Climacium dendroides. Marshy meadows near Uxbridge, April 1886; Fray's Meadows, 18.xii.1891 'boggy places' [2 specimens]; wet meadows near Uxbridge, 18.xii.1891; margin of Ruislip Reservoir, 8.vi.1892, 21.x.1892 [2 specimens]; growing on the bare sawn surface of trunk of a felled tree by the lake in Swakeleys Park, 28.xi.1893.

Leucodon sciuroides. Old chalk-pit in Harefield Park, 10.xii.1895 'with Arthur'.

RG *Neckera complanata*. Hillingdon, 23.ii.1892 'this is Dr Braithwaite's station for *Homalia*'; Hayes, 27.ii.1892; Ruislip woods, 1.iv.1892; on chalky banks, hill above Jack's Lock near Harefield, 30.iv.1892; on brickwork of the bridge below Breakspear's, 30.iv.1892 [all these specimens were misnamed *Homalia trichomanoides*]; chalky banks, Garret Wood, 23.iv.1892; Swakeleys Park, with *Homalia trichomanoides* 'growing together on the same tree', 4.iii.1893; Old Park Wood, Harefield, 20.iii.1893; old chalk-pit, Harefield Park, 2.iii.1894.

Homalia trichomanoides, Uxbridge district, May 1886; Duck Wood, 28.xii.1891 'abundant'; Harefield, 23.iv.1892; Garret Wood, 23.iv.1892; Ruislip woods, 5.xi.1892 'in young fruit'; with *Neckera complanata*, 4.iii.1893 'growing together on same tree'; wood E side of Ruislip Reservoir, 8.iii.1893 '72nd birthday'; Old Park Wood, Harefield, 20.iii.1893.

G *Thamnobryum alopecurum*. Ditches, Hayes, 27.ii.1892; on dry chalk banks, Garret Wood, 8.iii.1892 '71st birthday'; on dry chalk banks above Jack's Lock, 30.iv.1892 'abundantly'; lane from Harefield to Moor Hall, 2.x.1893; old chalk-pit in meadow between brickfields and Jack's Lock, near Harefield, 29.i.1896.

GW *Leskea polycarpa*. Uxbridge, May 1886; by the brook in Park Wood, Swakeleys, 7.viii.1894; Fray's Meadows, Uxbridge, 8.vii.1896.

Anomodon viticulosus. Banks between Highway Farm and the turn to Moor Hall, 8.iii.1892; on bare chalk banks, Garret Wood, 23.iv.1892; on trees and banks, on clay, Long Lane, Ickenham, 8.iii.1893; on trees in the old chalk-pit, Harefield Park, 31.v.1893 'common on the chalk'; lane from Jack's Lock to Harefield, 21.xi.1893; Eastcote, 5.iii.1894.

RGW *Thuidium tamariscinum*. Old Park Wood, Harefield, May 1886; copse below Uxbridge Common, May 1886; Garret Wood, May 1886; Gospel Oak copse, near Uxbridge Common, November 1890; Duck's Hill Heath and Ruislip woods, 8.iii.1893.

R *T. philibertii*, Chalk downs, Harefield, 25.iii.1893; on chalk about Springwell, Garret Wood, 25.iii.1893 [published in *J.Bot.* **32**:370 as *T. recognitum*].

RGW *Cratoneuron filicinum*. Uxbridge district, 1886 'Yes—J. E. Bagnall'; Fray's bridge, Uxbridge, May 1886; on campshedding of Horseshoe tumbling-bay near Jack's Lock 'Mr J. E. Bagnall names it *A. irriguum*' 12.vii.1891; Yiewsley, 26.vii.1891; on willow stumps, Fray's Meadows, 7.v.1892; canal side between Denham and Moor Locks, 18.v.1892 [2 specimens, one marked 'J. E. B.']; common on chalk bank, Garret Wood, Springwell, etc.,7.ii.1893; grass on bare chalk in Garret Wood, 25.iii.1893 'a small form'; on posts by water, Fray's bridge, 5.vi.1893 'typical'.

Campylium stellatum. Near Jack's Lock, Harefield, 25.iii.1893; ditch on Ruislip Common, 7.xi.1893.

R W *C. chrysophyllum*. Uxbridge district, near Swakeleys, May 1886; chalk banks, Garret Wood, 23.iv.1892, 17.ii.1893; between Harefield and Springwell, 25.iii.1893; Springwell, 2.x.1893; amongst grass on the downs, Harefield, 21.xi.1893; hill meadows above Ruislip Reservoir, 10.iii.1894.

C. calcareum. Chalky banks about Harefield, April 1892 'abundant, mixed with *C. chrysophyllum*'; chalk bank, Garret Wood, 23.iv.1892 'intermixed with *C. chrysophyllum* and other species'; chalky banks near Jack's Lock, 30.iv.1892; chalky banks in lane above Jack's Lock, near Harefield, 30.iv.1892; old chalk-pit in Harefield Park, 2.iii.1894, 5.v.1894 'abundant', 21.ix.1896.

RGW *Amblystegium serpens*. Uxbridge, May 1886 [3 specimens]; second spinney by Park Wood, Swakeleys, 27.xii.1891; on trees, Garret Wood, 8.iii.1892 'my 71st birthday'; on chalky banks in lane above Jack's Lock, 20.iv.1892 'growing with *Hypnum somerfelti* and in appearance and habit like it'; hill down to brook by Highway Farm from Uxbridge, 7.ii.1893 'leaves peculiar'; near Highway Farm, 18.xii.1893 'in fruit'.

W *A. tenax*. On walls of Horse-shoe bay near Jack's Lock, 18.v.1892 'J. E. B.'; hill meadows E of Ruislip Reservoir, 10.iii.1894 'I think so—J.E. Bagnall'.

A. varium. Uxbridge, May 1886 'or *A. serpens* var. *majus*?'; Fray's bridge, Uxbridge, May 1891; canal side, May 1892; on alder stumps, Swakeleys Lake, 5.v.1892; on the small tumbling-bay between Denham and Moor Locks, 7.v.1892; posts in the pond by Manor Farm, Ickenham, 14.v.1894 'with Ivo'; margin of lake in Swakeleys Park, 15.iv.1895; canal walls, Harefield Moor, 29.iv.1895; old willow stumps close to ground and water, Fray's Meadows, Uxbridge, 3.v.1895; on posts in water by the water-splash. Swakeleys Lake 3.v.1895.

RGW *A. riparium.* Swakeleys, May 1886; on planks of 'cut' by canal, Yiewsley, 6.viii.1891; planks by water-splash, end of Swakeleys Lake, 29.viii.1891; on campshedding, water-splash, end of Swakeleys Lake, 27.iii.1892 'with Capt. J.E. Benbow'; Swakeleys, 14.v.1892; Ruislip woods, 21.x.1892; West Drayton, 15.xi.1892 'in fruit'.

GW *D. repanocladus aduncus.* Boggy place in Fray's Meadows, May 1886 'J. E. B.'; in 'old cuts' canal, Yiewsley and West Drayton, 29.v.1891; ditches and meadows about Harefield Moor 23.iv.1892; ditch, bottom of downs between Jack's Lock and the Copper Mills, 23.iv.1892 Harefield Common, 30.iv.1892; Ruislip Reservoir, 7.xi.1893 '*H. aduncum* var., profusely abundant when the water is low'; boggy places in Fray's Meadows, Uxbridge, 24.iv.1897 Fray's Meadows near Uxbridge, 8.iii.1898 '77th birthday'.

D. fluitans. Near Uxbridge, May 1886; pond, N side of Uxbridge Common, May 1886; boggy place on Harefield Common, May 1886; Harefield Common, 30.iv.1892 [4 specimens] pond on Duck's Hill Farm, 30.vii.1892. [The following specimens were named *Hypnum exannulatum* by J.E. Bagnall and published as such in *J.Bot.* **32**:107—subsequently corrected by a note in Benbow's MS *Flora of Middlesex*: 'Mr H N Dixon says they are *H. fluitans*] swampy places on Ruislip Common, 9.v.1892; old sand-pits, Northwood, 24.iv.1893; Ruislip Reservoir, 6.ix.1893.

Hygrohypnum luridum. Planks of campshedding, water-splash, Swakeleys Lake, May 1886 canal side between Denham and Moor Locks, 16.iv.1892 [2 specimens], 18.v.1892 'abundant' Uxbridge, 18.v.1892; canal side near Harefield Moor Lock, 4.vi.1892; canal side, 10.iii.1893

RG *Calliergon cordifolium.* Marshy places in the copse by Uxbridge Common, 4.x.1893 [2 specimens]; NW margin of Ruislip Reservoir, 7.xi.1893 'abundant'; Ruislip Reservoir 7.xi.1893.

RGW *C. cuspidatum.* Marshy meadow near Uxbridge, April 1886; Park Wood, Swakeleys, May 1886 'a curious form'; Garret Wood, May 1886 'on a chalk down!'; bog by the County Bridge, Cowley, August 1890; Duck's Hill Heath, September 1891; Ickenham, September 1891 'in fruit'; margin of Ruislip Reservoir, 8.vi.1892; abundant on bare chalk, Garret Wood 25.iii.1893.

R *Isothecium myurum.* Uxbridge, May 1886; near Harefield, 23.iv.1892; Ruislip woods, on ground under trees, 5.xi.1892 'in fruit', 10.xii.1892, 1.ii.1893 'with Capt. J.E. Benbow'; Northwood 1.ii.1893 'with Capt. J.E. Benbow'.

GW *I. myosuroides.* Ruislip woods, 11.x.1892, 5.xi.1892, 30.xi.1892; by brook in Park Wood Swakeleys, 6.viii.1894; Park Wood, Swakeleys, on willows by the brook, 6.viii.1894; on willow, side of the brook, Park Wood, Swakeleys, 28.viii.1894 [the three latter specimens were misnamed *Brachythecium salebrosum*].

R W *Homalothecium sericeum.* On walls, King's End, near Ruislip, 3.xi.1891 [2 specimens]; walls Ruislip, 25.xi.1891, 1.xii.1891; old wall near Harefield, 4.iv.1893 'with Ivo'.

RGW *H. lutescens.* Near Uxbridge, May 1886; on tree-stumps, Garret Wood, 8.xii.1891; chalk downs about Harefield and Springwell, 23.iv.1892; outside Harefield Park Wood, 5.x.1893; chalk-pit, Harefield, 19.x.1893.

RGW *Brachythecium albicans.* Moor below Harefield, May 1886; road by Uxbridge Common, June 1886; copses around Uxbridge, October 1891; on ground amongst grass, old gravel pits wood by lodge to Swakeleys, 12.xii.1891; chalk banks, Garret Wood, 23.iv.1892; Ruislip Common, 1.ii.1893; canal walls between Denham and Moor locks, 1.x.1897.

B. glareosum. Chalk banks, Garret Wood, 23.iv.1892.

B. mildeanum. Park Wood, Swakeleys, 17.xi.1891 (confirmed by Bagnall as *B. salebrosum* and published as such in *J. Bot.* **32**: 107); canal walls between Denham and Moor Locks 8.iii.1895 '74th birthday'; canal walls between Denham and Moor Locks, 24.iv.1897.

RGW *B. rutabulum.* Bank by Cox's farm. Uxbridge Common, 20.x.1891; wall of the ditch below Mr Cox's farm. Uxbridge Common, 20.x.1891; Ickenham Road, Uxbridge, 7.xi.1891 20.i.1892; Gospel Oak Wood, near Uxbridge, 24.xi.1891; Turner's nursery, Uxbridge 1.i.1892; on the bridge at head of Swakeleys Lake, 3.xii.1892; wall below Cox's farm Uxbridge Common, 1.iii.1893; canal walls between Denham and Moor Locks, 30.ix.1897 2.x.1897, 1.ii.1901.

RGW *B. velutinum*. In my garden, Uxbridge, May 1886; Park Wood, Swakeleys, 17.xi.1891; copse below Uxbridge Common, 8.xii.1891; on tree-stumps, Garret Wood, 8.xii.1891; sandy banks in Turner's nursery, Uxbridge, 1.i.1892 'in fruit'; copse below Uxbridge Common, 23.i.1892; on banks about Hayes, 23.ii.1892; banks near Uxbridge Common, 27.iii.1892; on trees, Swakeleys, 4.ii.1893.

RG *B. populeum*. Copse by Uxbridge Common, 6.ii.1892; near Uxbridge Common, 22.ii.1892; Hillingdon, 11.xii.1892; hill from Uxbridge down to brook near Highway Farm, 19.xi.1893; canal walls between Denham and Moor Locks, 8.iii.1895 'my 74th birthday!'.

RGW *Pseudoscleropodium purum*. Copse by Uxbridge Common, April 1886 'in fruit'.

R W *Cirriphyllum piliferum*. Second spinney by Park Wood, 27.xii.1891; Gospel Oak spinney, 16.v.1892 'very rare in fruit'.

C. crassinervium. Copse above Jack's Lock, Harefield, 8.iii.1895; old chalk-pit in Harefield Park, 10.iv.1896 'J. E. B.'.

R W *Rhynchostegium riparioides*. Tumbling-bay near Jack's Lock, 12.vii.1891; walls by canal between Denham and Moor Locks, 27.ix.1892; wall of canal by the horse bridge between Denham and Moor Locks, 5.xii.1892; canal banks, 27.i.1893; between Denham and Harefield Moor Locks, 7.ii.1893; tumbling-bay between Denham and Moor Locks, 10.iii.1893; on damp sides of brook in Park Wood, Swakeleys, and in many places by the brook between Uxbridge and Ickenham Green, 20.ii.1894 'a small form—leaves almost orbicular'.

R. murale. Wall, Ruislip, 25.xi.1891, 1.iv.1892; wall of Mr Blud's garden, back of schools, Harefield, 8.iii.1892 'abundant—71st birthday'; wall of cottage, Ruislip, 21.x.1892; walls of Mr Cox's barns, Uxbridge Common, 11.xii.1892; walls, Cox's farm, Uxbridge Common, 1.iii.1893; wall by bridge over brook, Honey Hill bottom, Ickenham Road, 19.iv.1893; walls, Uxbridge, 27.x.1893.

RGW *R. confertum*. My garden, April 1886; on willows, Uxbridge, 6.iii.189?; Harefield woods, April 1892; on willow stumps, Fray's Meadows, 10.iv.1892; wall of Breakspear's, 11.xi.1892; walls near Harefield, 11.xi.1892; tumbling-bay between Denham and Moor Locks, 5.xii.1892; Fray's Meadows, 18.xii.1892; near Moor Hall, Harefield, 18.v.1893.

R. megapolitanum. Between Highway Farm and Harefield, by turn to Breakspear's, 7.ii.1893, 17.ii.1893 'J.E. Bagnall'; hill down to Highway Farm from Uxbridge, 7.ii.1893; sandy banks between Highway Farm and Harefield, by turning to Breakspear's, 17.ii.1893; Harefield Road by turning to Breakspear's, 22.i.1901 'death of Queen Victoria'; by turning to Breakspear's, Harefield Road, 8.iii.1901 'my 80th birthday'.

'I cannot differentiate *E. megapolitanum* from *E. confertum*—to me it seems only a more robust and larger variety, and many intermediates connect the two. Mr H.N. Dixon says it is "without radicles" whilst *E. confertum* "adheres by radicles", but this is an error. A typical form in my collection from the British Museum has radicles adhering to it! And so has the specimen from Harefield Road named *E. megapolitanum* by Mr J.E. Bagnall!. J. Benbow'.

RGW *Eurhynchium striatum*. Garret Wood, 8.xii.1891; Northwood, 2.ii.1892; chalky banks about Harefield, 30.iv.1892; Ruislip woods, 9.v.1892; ditches, Hayes, November 1892.

RGW *E. praelongum*. Copse by Uxbridge Common, April 1886; copses about Uxbridge, May 1886; Garret Wood, 7.ii.1893.

RGW *E. swartzii*. Ditches near Breakspear Arms, 18.iv.1892; chalk bank, Garret Wood, 23.iv.1892; abundantly on chalky banks, hill above Jack's Lock, Harefield, 30.iv.1892; on chalk banks, Springwell pits, 25.iii.1893 'abundantly—Mr J.E. Bagnall writes of this: "a large variety of which I should like a specimen for further study"—portion forwarded to Mr Bagnall—very abundant on the chalk but never fruits'; between Uxbridge and Harefield, 21.xi.1893; between Highway Farm and Harefield 4.i.1895 [misnamed *Rhynchostegium megapolitanum*].

E. schleicheri. Chalk-pits, Harefield, 9.ix.1893 'very rare, fide J.E. Bagnall'; chalk banks, hill down to Springwell Farm, 8.vi.1899 [2 specimens].

E. speciosum. Margin of Swakeleys Lake, June 1886; on campshedding, Swakeleys Lake, 26.xii.1891 'J. E. B.' [2 specimens]; posts, sticks and roots in water, Swakeleys Park Lake, 22.xi.1893; by Swakeleys Lake, Uxbridge, 6.x.1893; water splash, Swakeleys Lake, 1.xii.1893; on posts, water splash, bottom of Swakeleys Lake, 16.i.1894; on trees close to water's edge, by County brook, Fray's Meadows, Uxbridge, 19.v.1894; canal walls, banks, etc., between Denham and Moor Locks, 8.iii.1895 'abundant'.

Rhynchostegiella tenella var. *litorea.* On branches of trees, in hedges and on banks, lane from Jack's Lock to Harefield, 8.iii.1891 '70th birthday' 'The original plant—see remarks upon it in Mr H.N. Dixon's new work *Handbook of British Mosses.* Seta rough—sent to Mr J.E. Bagnall some years after—he wrote: 'Yes, a singular form''. Dixon in 1896 named it *Eurhynchium tenellum* var. *scabrellum*—see his *British Mosses* p. 421. Dr Braithwaite in 1899 named it *Hypnum litoreum* De Not.—see his *British Moss Flora* vol. 3, p. 89.'

'The first discovery of it in Britain. Since the date of Dixon's notice Mitten (as usual) claims to have got it years ago, but could show no specimens till he found where his neighbour Nicholson gathered it!'

Hill into Harefield, opposite church, 8.iii.1892 '71st birthday'; on trees and in hedges near Harefield, 8.iii.1892 'seta rough, nerve to apex—a specimen also sent to H.N. Dixon'; on trees and banks on the chalk about Harefield, 17.ii.1893 'seta rough—"Yes, a singular form"—J.E. Bagnall—a specimen also given to Mr W.E. Nicholson'; about Harefield and Springwell, 17.ii.1893; [2 specimens]; chalk banks and trees, Springwell, 17.ii.1893 'seta rough'; lane from Jack's Lock to Harefield, 17.ii.1893; on stones in chalk-pit on downs near Copper Mills, Harefield,10.x.1893 'seta papillose and smooth'; bank opposite lane to Breakspear's between Highway Farm and Harefield, 18.xi.1893; trees by water-splash below Highway Farm, 18.xi.1893; hill up to Harefield, 18.xi.1893 '2 specimens, one given to Mr J.E. Bagnall'; lane from Highway Farm to Bayhurst Wood, 26.i.1894; between water-splash and Highway Farm, 26.i.1894 [2 specimens]; on damp ground by brook below Highway Farm near Harefield, 24.iii.1894; on willow stump in the willow copse by Denham Lock, 15.v.1896 [Benbow's herbarium includes a Sussex specimen from W.E. Nicholson, marked *Type.*]

RGW *Plagiothecium denticulatum.* Copse below Uxbridge Common, May 1886; Ruislip woods, 2.ii.1892 '*denticulatum* and *sylvaticum* mixed?'; Duck Wood, Ruislip, 7.xi.1893; Ruislip woods, on sand, rabbit warren, 4.iv.1895 'with Ivo'; Ruislip woods, 22.v.1895.

RG *P. nemorale.* Ruislip woods, 18.vi.1892 'nerve strong, either forked half-way or single nearly to apex'; Ruislip woods, 9.v.1892 'this seems in every respect to be *sylvaticum* but the inflorescence is autoicous'; between Uxbridge and Harefield, 7.ii.1894; Bayhurst Wood, 7.ii.1894; Ruislip woods, 6.vi.1895; Park Wood, Swakeleys, 21.v.1896; Long Lane, Hillingdon, with *P. denticulatum,* growing together, 4.iv. 1901 'these show well the facies of the two species, scarcely requiring the microscope to determine them'.

RGW *Hypnum cupressiforme.* Uxbridge, May 1886; copse below Uxbridge Common, 8.viii.1891; Mr Cox's lodge, Uxbridge, 14.xi.1891; Ruislip woods, 18.iv.1892, 30.xi.1892, 29.xii.1892.

GW *H. cupressiforme* var. *resupinatum.* Ruislip woods, 25.ii.1893 'J.E. Bagnall'; hill from Jack's Lock to Harefield, 20.iii.1893 'J. E. B.'; Garret Wood, Springwell, 16.xii.1893; near Eastcote, 5.iii.1894; east side of Ruislip Reservoir, 8.ii.1894; Park Wood, E. side of Ruislip Reservoir, 8.iii.1894; trees by Ruislip Reservoir, 14.v.1895; Ruislip woods–Northwood, 2.iii.1899.

R W *Ctenidium molluscum.* Uxbridge district, May 1886; Garret Wood, north of Harefield, May 1886; Ruislip woods, sides of watercourse, 1.vi.1892 'abundant'; on the downs grass between Jack's Lock and Copper Mills, 21.xi.1893.

RGW *Rhytidiadelphus squarrosus.* By Uxbridge Common, April 1886; Uxbridge, May 1886; Gospel Oak Wood, 24.xi.1891.

R. triquetrus. Ruislip woods, 28.xii.1891; Park Wood, E side of Ruislip Reservoir, 8.vi.1892; Garret Wood, 25.iii.1893 [2 specimens]; Old Park Wood and downs, Harefield, 2.iii.1894.

R. loreus. Copse, Uxbridge, May 1886; Ruislip woods, 28.xii.1891; wood east side of Ruislip Reservoir, 14.v.1895 'abundant'.

R *Hylocomium splendens.* Garret Wood, 8.xii.1891; about Ruislip woods, 28.xii.1891; Duck's Hill Heath, upper part, 2.ii.1892 'abundant'; Harefield, 23.iv.1892; Park Wood, E side of Ruislip Reservoir, 8.vi.1892; Park Wood, Ruislip Reservoir, 18.x.1892.

LIVERWORTS

RGW *Calypogeia fissa*. On ground, Uxbridge, November 1891 ‘Yes—J. E. B.’

RGW *Cephalozia bicuspidata*. On sand-heaps, Ruislip woods, 30.xi.1892 ‘J. E. B.’; Park Wood, Swakeleys, 19.iii.1893 ‘J.E.B’; wood by Uxbridge Common, 16.i.1894 ‘J. E. B.’; Park Wood, E side of Ruislip Reservoir, 26.iii.1894 ‘J. E. B.’.

R *Cephaloziella divaricata*. Wood by Uxbridge Common, 16.i.1894 ‘Yes—J. E. B.’.

RGW *Jungermannia gracillima*. Harefield common, 5.vii.1892 [misnamed *Aplozia sphaerocarpa* ‘J. E. B.’]; Duck Wood, Ruislip, 28.xii.1892 and Park Wood, E side of Ruislip Reservoir, 23.i.1894 [both these specimens misnamed *Aplozia pumila* ‘J. E. B.’]; wood E side of Ruislip Reservoir, 21.iii.1895, 14.v.1895; wood E side of Ruislip Reservoir, May 1895 ‘J. E. B.—with *Scapania nemorosa*’; Ruislip woods, May 1895.

R *Nardia scalaris*. Park Wood, E of Ruislip Reservoir, 26.iii.1894 ‘J. E. B.’.

R *Diplophyllum albicans*. Above chalk-pit, Harefield, 21.xi.1893.

GW *Scapania undulata*. Ruislip woods, April 1892; Harefield Common, 30.iv.1892 ‘Yes—J. E. B.’.

RGW *S. nemorea*. Ruislip woods, 2.ii.1892 ‘J. E. B.’ Park Wood, E of Ruislip Reservoir, 21.x.1892, 14.v.1895; Duck's Hill Heath, 26.xii.1893.

RGW *Lophocolea bidentata*. Uxbridge,1886; Honey Hill and Swakeleys copse, near Uxbridge Common, 26.iii.1886; on campshedding, end of Swakeleys Lake, 25.i.1891; Garret Wood, 7.ii.1893 ‘J. E. B.’; Ruislip woods, 25.iii.1893; old sand-pits, Northwood, 28.ix.1893; Park Wood, Ruislip, 23.i.1894.

RGW *L. heterophylla*. Copse by Uxbridge Common, May 1886 [2 specimens]; Ruislip woods, 25.ii.1893; on wall of tumbling-bay between Denham and Moor Locks, 8.v.1893 ‘J. E. B.’; trees, wood by Uxbridge Common, 16.i.1894.

Plagiochila porelloides. Ruislip woods, 2.ii.1892.

Radula complanata. On wall by water, canal between Denham and Moor Locks,27.i.1893; Harefield, 17.ii.1893; Long Lane corner by turn into Ickenham Road, 4.iii.1893 ‘Yes—J. E. B.’; Garret Wood, 16.xii.1893; copse above Jack's Lock, 29.i.1894.

Porella platyphylla. On trees in copses near Uxbridge Common, May 1886; old chalk-pit in Harefield Park, 31.v.1893; copse above Jack's Lock, 29.i.1894.

GW *Frullania dilatata*. Copses about Uxbridge, May 1886; on willows, Uxbridge, June 1886; lane above Jack's Lock, Harefield, 31.x.1892, 20.iii.1893; trees about Highway Farm and Harefield, 18.xi.1893, 30.xii.1893 ‘Yes—J. E. B.’; by the brook in Park Wood, Swakeleys, 20.ii.1894.

Lejeunea cavifolia. Lane above Jack's Lock, Harefield, growing with *Neckera complanata*, November 1892 ‘Yes—J. E. B.’.

RGW *Pellia epiphylla*. Bottom of wall of Cox's farm, Uxbridge Common, July 1894; on small tumbling-bay between Denham and Moor Locks, 14.vii.1894; Ruislip woods, 6.vi.1895.

GW *Metzgeria furcata*. Park Wood, E of Ruislip Reservoir, 8.iii.1894 ‘J. E. B.’; wood below Uxbridge Common, July 1894; Park Wood, Swakeleys, 17.ii.1895.

RGW *Lunularia cruciata*. Abundant in my garden, Uxbridge Common, 31.vii.1894,18.xi.1895, May 1897; bridge and posts by the water-splash, Swakeleys Lake, 21.xi.1894, 27.iv.1898.

GW *Marchantia polymorpha*. Sluice, horse-shoe tumbling-bay near Jack's Lock, 29.ix.1894, 14.vi.1895; wall of Mr Cox's farm, Uxbridge Common, 16.i.1895, 7.vi.1895.

APPENDIX 1

The Middlesex bryophytes of John Campbell Gardiner in The Natural History Museum

In 1988 Jack Gardiner (1905–1989) presented his herbarium of Middlesex mosses an liverworts to The Natural History Museum. The collection consists of 158 specimen representing 112 species from throughout the vice-county, including many from Ruisli and Harefield districts.

MOSSES

Sphagnum palustre. Boggy ground by spring in woodland, west of Kenwood House, 28.ix.1983.

S. squarrosum. Boggy ground by spring in woodland, west of Kenwood House, 28.ix.1983.

S. fimbriatum. Boggy ground by spring in woodland, west of Kenwood House, 28.ix.1983; bog, Wes Heath, Hampstead, 28.ix.1983.

S. auriculatum var. *auriculatum.* Damp places in field west of Ruislip Reservoir, 1.i.1981: Harrov Weald Common, 14.viii.1981.

S. recurvum var. *mucronatum.* Boggy ground by spring in woodland, west of Kenwood House 28.ix.1983; bog, West Heath, Hampstead, 28.ix.1983.

Polytrichum longisetum. On pile of rotting logs, Fir and Pond Wood near Potters Bar, 1960 (coll. Pau Driver).

P. commune. Damp place in ride, Copse Wood near Ruislip, 7.x.1983.

Pleuridium acuminatum. Clayey ditch, Copse Wood near Ruislip, 6.iii.1982.

P. subulatum. On introduced soil under rhododendrons, Finsbury Park, 8.iii.1982.

Ditrichum cylindricum. Clayey places, field west of Ruislip Reservoir, 1.i.1981.

Seligeria paucifolia (with some *S. calcarea*). Disused chalk-pit, Springwell,near Harefield, 4.vii.1981

Ceratodon purpureus. On wall in Brook Street, off Sussex Square W2, 10.i.1965; on trunk of willov tree, Tarleton's Lake, Bayhurst Wood, near Ruislip, 27.viii.1983.

Dichodontium pellucidum. Edge of pond round fountain, garden between York House and River Thames Twickenham, 10.x.1982.

Dicranella schreberana. On introduced soil under rhododendrons, Finsbury Park, 8.iii.1982.

D. staphylina. Edge of 'swallow hole', Ruislip Local Nature Reserve. 24.ix.1983; in track, Ten Acre Wood, Hillingdon, 9.xi.1983.

D. heteromalla. On tree stump in Park Wood, near Ruislip, 2.vii.1983.

Dicranoweisia cirrata. On burnt tree stump, Copse Wood, near Ruislip, 6.iii.1982.

Dicranum bonjeanii. In rough turf, Poor's Field, Ruislip, 1.v.1981.

D. scoparium. On ground under trees, Mad Bess Wood, Ruislip, 5.xii.1980.

D. majus. Under beeches, Copse Wood, near Ruislip, 16.x.1960 (coll. C. Bowlt).

D. montanum. On tree bases, Copse Wood, Ruislip, 1.v.1980; on tree stumps, Mad Bess Wood, Ruislip 5.xii.1980; on rotting tree stumps, Copse Wood, Ruislip, 6.iii.1982.

D. flagellare. On tree stumps and rotting wood, Park Wood, Ruislip, 1.v.1981; tree stump, Park Wood Ruislip, 5.viii.1982; tree stump, Bayhurst Wood, Ruislip, 3.viii.1983.

D. tauricum. On dead branch (with *D. montanum*), Old Park Wood (outside Reserve), near Harefield 20.iv.1981.

Fissidens viridulus. Clayey ground near Grand Union Canal west of Harefield, 20.iv.1981; claye ditch, Harefield Place Nature Reserve, by Uxbridge Golf Club, 13.iv.1983.

F. pusillus var. *tenuifolius.* Shaded stonework of tombstone, St Mary's, Harefield parish churc 13.iv.1983.

F. incurvus. On clayey bank by stream at north end of Ruislip Reservoir 1.i.1981; in a clayey ditc Bayhurst Wood, Ruislip, 15.i.1983.

crassipes. Margin of pond round fountain, garden between York House and River Thames, Twickenham, 10.x.1982.

exilis. In a clayey place, field west of Ruislip Reservoir, 1.i.1981.

cristatus. On introduced limestone by artificial stream, Syon House, 1.ix.1982.

ortula laevipila. Base of tree by River Thames, Penton Hook Island, 27.x.1982.

muralis var. *aestiva.* Embankment of River Thames, Duke's Meadow, Chiswick, 13.xii.1980.

latifolia. On willow by River Thames, Laleham, 10.xii.1980; on concrete steps, edge of woodland, near but not overhanging water, Whitewebbs Park, Enfield, 23.ii.1982; on concrete of disused reservoir, Tarleton's Lake, Bayhurst Wood, Ruislip, 27.viii.1983.

loina rigida (with some *A. ambigua*). Floor of disused chalk quarry, Springwell, near Harefield, 4.vii.1981.

. aloides var. *aloides.* Chalky slope of old chalk quarry near Harefield, 8.v.1982.

. aloides var. *ambigua.* 'Bench' of old chalk quarry near Harefield, 5.v.1982.

ottia bryoides. In gravelly path between Lido and Nature Reserve, Ruislip Reservoir, 1.i.1981.

ennediella macrophylla. Sandy loamy bank, gardens of Chiswick House, 14.ix.1972; grounds of Chiswick House (with immature sporophytes), 17.v.1973; grounds of Chiswick House (c.fr.), 16.iii.1977; in thin turf by track near Commonwealth Institute, Holland Park, 3.iv.1981; by River Brent, Brent Lodge Park, Hanwell (c.fr.), 26.iii.1982; on soil in rock garden, Walpole Park, Ealing, 18.i.1984.

arbula convoluta var. *convoluta.* Stonework by River Crane, west side of Hounslow Heath 8.v.1981.

. convoluta var. *commutata.* On stonework by grotto, Chiswick House grounds, 26.i.1983.

. hornschuchiana. On gravelly path between Ruislip Lido and Nature Reserve, 1.v.1981; on gravelly path, Crane Park, Twickenham, 8.v.1981; crevice in paving stones, garden between York House and River Thames, Twickenham, 10.x.1982.

. cylindrica. On rock by path in gardens of Hampton Court, 18.iii.1981; on wall, Holland Park, 3.iv.1981; stony ground in filled-up chalk-pit west of Harefield, 20.iv.1981.

. sinuosa. Stone embankment of River Thames between Kingston and Hampton Court bridges, 26.xii.1967; on wall of old swimming pool near Tarleton's Lake, Bayhurst Wood, Ruislip, 2.ix.1981; on stonework by grotto, Chiswick House grounds, 26.i.1983.

ryoerythrophyllum recurvirostrum. Wall of old swimming pool near Tarleton's Lake, Bayhurst Wood, Ruislip (c. fr.), 2.ix.1981; on decaying bark, in meadow below Syon House, 10.xi.1982.

richostomopsis umbrosa. Crevice of stonework round pond in garden between York House and River Thames, Twickenham, 26.xi.1980; brickwork in gardens of Syon House, 1.ix.1982; canal wall, South Harefield, 4.ix.1982; on brick/concrete wall of moat, Woodland Garden, Bushy Park, Hampton Court, 30.x.1982.

Leptodontium flexifolium. Sandy turf by Diana's Fountain, Bushy Park, near Hampton Court, 10.x.1982.

L. gemmascens. On dead grass between molehills, heathy ground, Pond Wood, near Potters Bar, 25.i.1981.

Schistidium apocarpum. Stone banks of River Thames, Penton Hook, near Laleham, 25.v.1981.

Physcomitrella patens. Dried-up floor of Tarleton's Lake, Bayhurst Wood, near Ruislip, 27.viii. 1983.

Leptobryum pyriforme. On dead log, Trent Park, near Cockfosters, 29.x.1980.

Pohlia annotina. Bank of recently-cleared stream, Harrow Weald Common, 14.viii.1981.

P. lescuriana. In wet ditch, Mad Bess Wood, near Ruislip, 5.xii.1980; side of ditch, Park Wood, Ruislip, 5.viii.1982; shady bank, east side of Ruislip Lido, 24.ix.1983.

Bryum subelegans. On elder, Perivale Wood,15.ii.1984 (coll. M. Milnes-Smith).

B. caespiticium. Chalk slope of old chalk quarry near Harefield, 8.v.1982; old wall, Ruislip Lido, 24.ix.1983 (c. fr.).

B. bicolor. On damp clayey ground around edge of pond, outside west corner of Bayhurst Wood, near Ruislip, 15.i.1983.

B. gemmiferum. Gravelly bank by River Thames, Penton Hook Island, near Laleham, 20.v.1981.

B. dunense. On damp clay around edge of pond, outside of west corner of Bayhurst Wood, near Ruislip, 15.i.1983.

B. argenteum. Stone wall of River Thames between Kingston and Hampton Court Bridges, 26.xii.1967 ('green form', 'v. majus' of Dixon).

B. radiculosum. Mortar of vertical brick wall, Harmondsworth (with *Tortula muralis*), 31.i.1981.

B. tenuisetum. By track, Bayhurst Wood, near Ruislip, 2.ix.1981.

Plagiomnium rostratum. Around base of small dead tree stump, periodically subject to flooding by River Thames, meadows between Syon House and the Thames, Isleworth, 10.xi.1982; on ground under trees with introduced (?) chalk, Whitewebbs Park, Enfield, 13.iii. 1984.

Aulacomnium palustre. Damp place in field west of Ruislip Reservoir, 1.i.1981.

Orthotrichum affine. On branch of elder, Tarleton's Lake, Bayhurst Wood, near Ruislip, 27.viii.1983.

O. anomalum. On concrete of disused reservoir, Tarleton's Lake, Bayhurst Wood, near Ruislip, 27.viii.1983.

Neckera complanata. On tree roots, Coppermill Down, near Harefield, 30.v.1981.

Thamnobryum alopecurum. Base of concrete reservoir, Tarleton's Lake, Bayhurst Wood, near Ruislip, 3.viii.1983.

Leskea polycarpa. By Cuffley Brook, Whitewebbs Park, Enfield, 22.iii.1982.

Thuidium philibertii. Chalk down near Springwell chalk-pit, near Harefield, 21.i.1951 (coll. R.A. Boniface).

Cratoneuron filicinum. Embankment of River Thames near Hampton Court, 13.ix. 1977; on rotting log in water at edge of pond in Woodland Garden, Bushy Park, 1.vi.1981; edge of canal sluice, near Harefield, 4.ix.1982.

Amblystegium tenax. On stone work by River Crane, west side of Hounslow Heath, 8.v.1981; bank of River Thames, Penton Hook 20.v.1981; concrete bank of River Thames, Hampton Court Park, near Kingston Bridge, 21.vi.1981.

A. humile. Gritty gravelly margin of River Thames, Penton Hook Island, near Laleham, 20.v.1981.

Drepanocladus aduncus. In long grass on clayey ground at margin of small pond outside west corner of Bayhurst Wood, Ruislip, 15.i.1983; bog, West Heath, Hampstead, 28.ix.1983; on rotting wood in small pond, Whitewebbs Park, Enfield, 13.ii.1984.

Calliergon cordifolium. Bottom of clayey ditch, Poor's Field, Ruislip, 24.ix.1983.

Homalothecium lutescens. Disused chalk quarry, Springwell, near Harefield, 4.vii.1981.

Brachythecium rutabulum. Grassy place by clayey track between Uxbridge Golf Club and canal, 26.x.1983.

B. velutinum. Roadside bank, Springwell Lane, near Harefield, 4.vii.1981; tree stump, Scratch Wood, 19.iii.1984.

B. populeum. Stony ground, SW corner of Harefield Place Nature Reserve, by Uxbridge Golf Course, 13.iv.1983.

Scleropodium cespitans. Embankment of River Thames near Hampton Court, 13.ix.1977; in cobblestones by old stables, Cranford Park, 24.vi.1981.

Cirriphyllum crassinervium. Base of wall, gardens of Hampton Court, 2.iii.1981.

Rhynchostegium murale. Wall in gardens of Hampton Court, 13.ix.1977; brickwork of bridge, Golders Hills Park, Golders Green, 18.xii.1982.

Eurhynchium striatum. Under trees near chalk, Whitewebbs Park, Enfield, 13.iii.1984.

E. swartzii. On wall of bridge over stream, Golders Hill Park, Golders Green, 22.iv.1981.

Rhynchostegiella tenella. Wall in grounds of Grim's Dyke Hotel, Harrow Weald, 13.ii.1982.

Plagiothecium latebricola. Base of tree, Perivale Wood, 3.iv.1982.

P. denticulatum. On ground at edge of wet woodland west of Kenwood House, 28.ix.1983.

P. curvifolium. Mad Bess Wood, near Ruislip, 5.xii.1980.

P. succulentum. Woodland banks, Whitewebbs Park, Enfield, 22.iii.1982; Copse Wood, near Ruislip, 29.i.1983.

P. nemorale. Copse Wood, near Ruislip, 6.iii.1982.

P. undulatum. Garden of Grim's Dyke Hotel, Harrow Weald, 23.iii.1981 (coll. M. Milnes-Smith).

Hypnum cupressiforme var. *lacunosum.* Asbestos roof of barn near Uxbridge Golf Club clubhouse, 30.i.1981.

H. cupressiforme var. *resupinatum.* On damp rotting logs, Ten Acres Wood, Hillingdon. 9.xi.1983.

H. mammilatum. Base of tree bole, Copse Wood, near Ruislip, 6.iii.1982.

Hypnum jutlandicum. Edge of Mad Bess Wood, near Ruislip, 5.xii.1980.

LIVERWORTS

Calypogeia muellerana. In ditch, Harrow Weald Common, 14.viii.1981; bank of stream, Copse Wood, near Ruislip, 29.i.1983.

C. arguta. Banks of ditch, Copse Wood, near Ruislip, 29.i.1983.

Cephalozia bicuspidata var. *bicuspidata.* On gravelly ground over London Clay, under oak tree, NE corner of Park Wood, near Ruislip, 2.vii.1983.

Cephaloziella divaricata. Sandy ground on Hounslow Heath (with *Dicranella heteromalla*), 8.v.1980.

Lophozia perssonii. In crevices in disused chalk quarry, Springwell, 4.vii.1981.

L. bicrenata. Sandy ground, Hounslow Heath, 8.v.1981.

Leiocolea turbinata. Disused chalk-pit, Springwell, 4.vii.1981.

Gymnocolea inflata. On ground under tree near boggy swamp, West Heath, Hampstead, 18.xii.1982.

Nardia scalaris. Bank of dyke, grounds of Grim's Dyke Hotel, Harrow Weald, 13.ii1982.

Scapania irrigua. On bank of small stream, Park Wood, Ruislip, 13.v.1981.

S. undulata. In quantity along gravelly bottom of dry stream, Park Wood, near Ruislip, 26.x.1983.

S. nemorea . In gravelly ditch, Park Wood, near Ruislip, 5.viii.1982; in nearly dry gravelly ditch, Park Wood, near Ruislip, 5.viii.1982.

Chiloscyphus polyanthos. Along bank of small gravelly stream, Copse Wood, near Ruislip, 6.ii.1982.

Frullania dilatata. Ruislip Local Nature Reserve (with J.G. Duckett), 29.i.1983.

Fossombronia pusilla. Clayey ditch, Copse Wood, near Ruislip, 6.iii.1982; clayey ditch, north corner of Mill Hill Golf Club, adjoining Scratch Wood, 30.x.1983.

Pellia endiviifolia. Edge of pond round fountain, garden between York House and River Thames, Twickenham, 10.x.1982.

Riccardia chamedryfolia. Sides of clayey ditch, north end of Mill Hill Golf Club, Scratch Wood, 30.x.1983; marsh in Pond Field, Perivale Wood, 15.ii.1984.

Metzgeria furcata. Wall of ditch round Harefield parish church (with *Zygodon viridissimus*), 13.iv.1983.

Conocephalum conicum. On wall of pond, Woodland Garden, Bushy Park,1.vi.1981.

APPENDIX 2

Bryophytes of north-west Middlesex recorded by Elinor Wiltshire from 1992 to 1995

The following mosses and liverworts were found in areas previously searched by John Benbow from 1886–1902, P.W. Richards from 1920–7, and J.C. Gardiner with M. Milnes-Smith and C. Bowlt from 1979–83. Initials in the left-hand margin indicate species recorded by them in the area.

Ruislip Woods SSSI comprises Park Wood, Copse Wood, Mad Bess Wood, Bayhurst Wood (including Tarleton's Lake Nature Reserve) and Poor's Field. It does not include Ruislip Reservoir (Lido). Old Park Wood SSSI is at Harefield.

MOSSES

BRG *Tetraphis pellucida*. Locally frequent on rotting bark. Park Wood, Swakeleys, 25.iv.1992; Old Park Wood, 21.viii.1993; Park Wood, Ruislip, 19.ii.1994.

Polytrichum longisetum. A few plants on disturbed ground in clearing, Copse Wood, 11.xi.1994.

BRG *P. formosum*. Locally frequent in Ruislip woods. Park Wood, 16.x.1992, 9.x.1994; Mad Bess Wood, 10.xii.1994.

BRG *P. piliferum*. Very local—found at only one site. A colony by gravelly path on heathy ground in Poor's Field,13.x.1994.

BRG *P. juniperinum*. Occasional on heathy patches in woods and in Poor's Field. Park Wood, Swakeleys, 10.iii.1992; Mad Bess Wood, 10.xii.1994; Poor's Field, 12.iii.1994.

BRG *Atrichum undulatum*. Frequent on bare clay in woods—in huge quantities on overgrown sand-workings by Harvil Road, South Harefield, 22.xi.1994; Old Park Wood, 21.viii.1993.

G *Pseudephemerum nitidum*. A minute colonist of moist bare ground, locally frequent on shaded paths. Park Wood, 24.vii.1994, 9.x.1994; Copse Wood, 26.ix.1994, 6.x.1994, 11.xi.1994; Mad Bess Wood, 1.x.1994, 10.xii.1994; Poor's Field, 9.x.1994.

BRG *Seligeria calcarea*. A minute moss which grows on bare chalk, sometimes abundantly. Springwell chalk quarry, 26.iii.1994.

BRG *Ceratodon purpureus*. Very common on thin turf and bare ground.

BR *Dicranella varia*. On level floor of old workings in Springwell chalk quarry, with patches of the liverworts *Leiocolea turbinata* and *Pellia endiviifolia*, 31.viii.1993.

BRG *D. heteromalla*. Widespread in woods on clay and tree bases.

BRG *Dicranoweisia cirrata*. Frequent in crevices in tree bark. Park Wood, Swakeleys, 10.iii.1992; Copse Wood, 12.iii.1994; Park Wood, 15,v,1994; Mad Bess Wood, 10.xii.1994; Old Park Wood, 21.viii.1993.

RG *Dicranum bonjeanii*. Rare in Middlesex. Among *Calluna* tussocks in Poor's Field, 9.x.1994.

BRG *D. scoparium*. Fairly frequent on ground in Ruislip woods and regenerating vigorously in some newly-coppiced clearings. Park Wood, 9.ix.1993, 24.iv.1994; Copse Wood, 30.ix.1993, 12.iii.1994, 26.ix.1994 (Figure 5); Mad Bess Wood, 10.xii.1994.

BRG *D. montanum*. An uncommon moss, first recorded for Middlesex by Benbow in 1894—still locally frequent on trees and stumps in Ruislip woods and found once in Harefield. Park Wood, 16.x.1992, 23.vii.1993, 9.x.1994, 4.xii.1994; Mad Bess Wood, 10.xii.1994; Old Park Wood, 7.ii.1995.

BRG *D. flagellare*. Rare in Britain, found mainly in the south-east—first recorded for Middlesex by Benbow in 1892. Very local on decaying stumps in Park Wood, 16.x.1992, 19.ii.1994 (Figure 6).

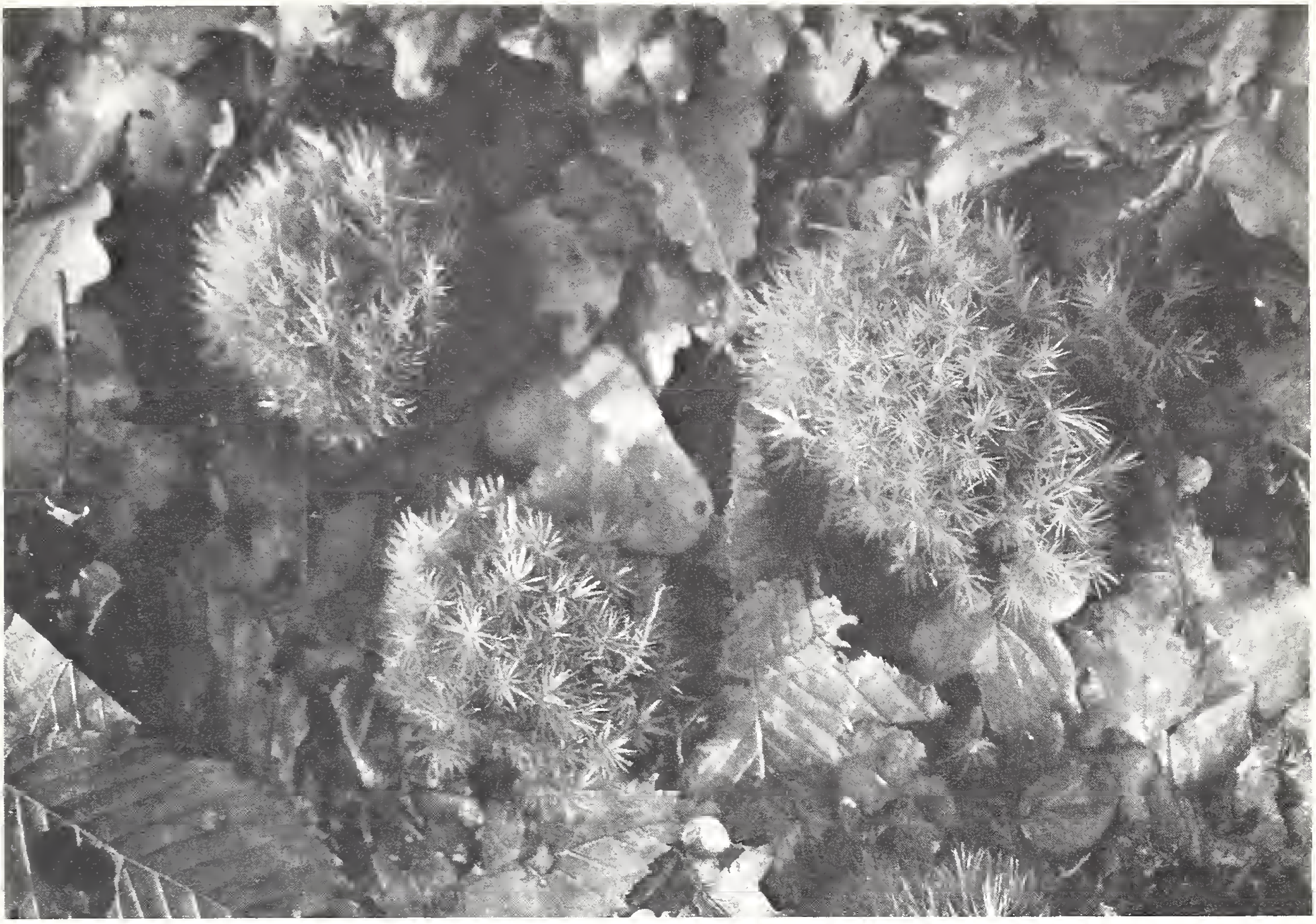


Figure 5. *Dicranum scoparium* regenerating in coppiced area, Copse Wood, Ruislip.

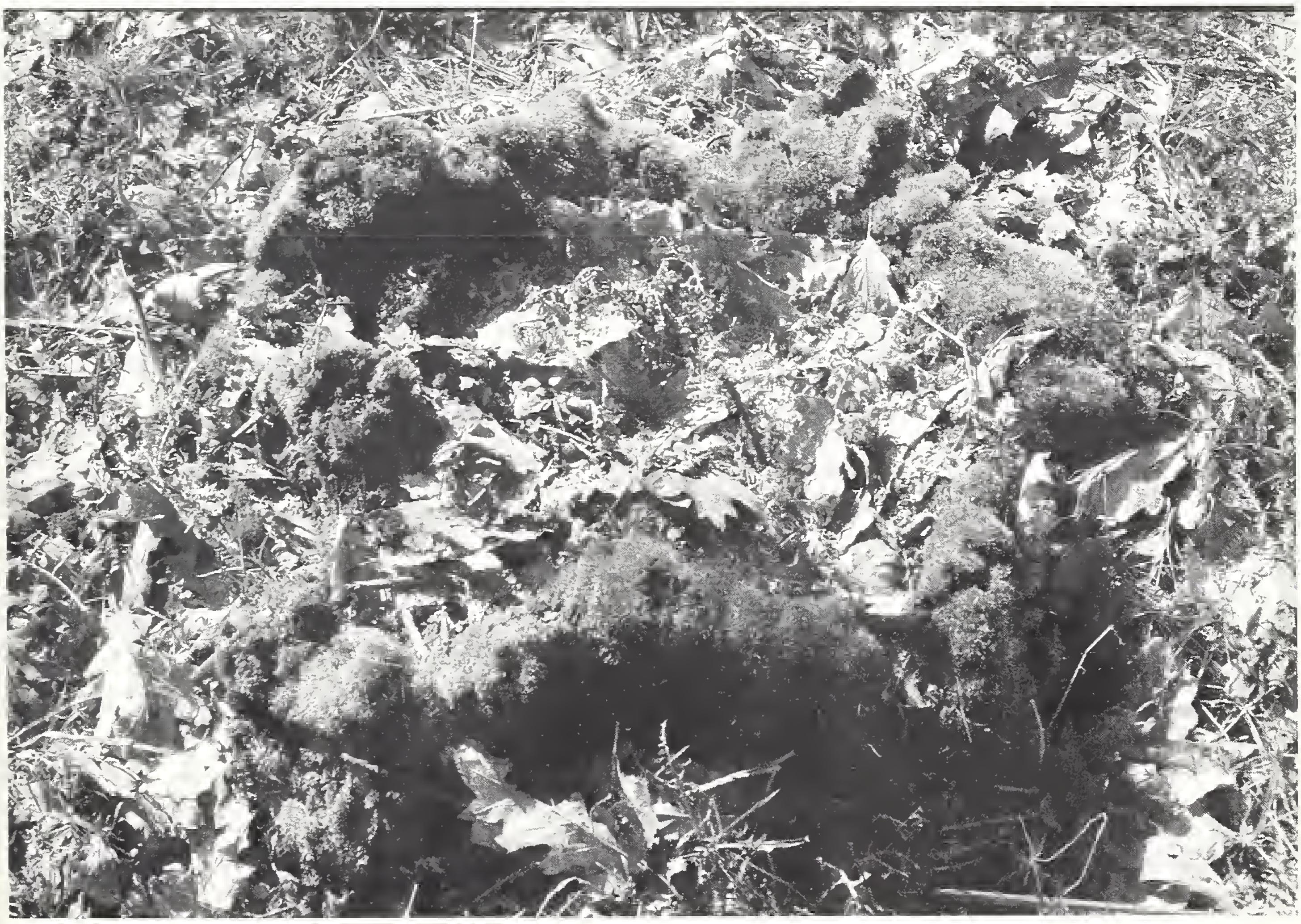


Figure 6. *Dicranum flagellare* on decaying stump, Park Wood, Ruislip.

G *D.tauricum.* Rare in Britain until 1930s but now widespread. Frequent in woods on rotting bark. Bayhurst Wood, 10.xii.1992; Park Wood, 16.x.1992; Copse Wood, 19.viii.1993; Old Park Wood, 15.viii.1992.

BRG *Campylopus paradoxus.* Occasional on decaying wood and on heathy ground. Mad Bess Wood, 1.v.1994, 10.xii.1994, 6.i.1995; Old Park Wood, 7.v.1994.

G *C.introflexus.* An alien moss, first recorded in Britain in 1941 and now widespread and abundant. Frequent on heathy patches in woods and in thin sward.

B G *Leucobryum glaucum.* Rare in Middlesex. A small patch on ground by coppiced hornbeam in Park Wood, 9.ix.1993.

BRG *Fissidens bryoides.* Frequent on moist clay banks, ditches and woodland floor.

BRG *F. taxifolius.* In similar sites to *F. bryoides*, but less frequent.

BR *F. cristatus.* A moss of chalk grassland. On Coppermill Down, Harefield, 29.ix.1994—new vice-county record (*Bull.BBS* **66**:41). Specimens collected here by Benbow were incorrectly named *F. adianthoides*, and Paul Richards considers that his '*F. adianthoides* (?)' specimen from Harefield (*J.Ecol.* **16**:290) was also probably *F. cristatus.*

Octodiceras fontanum. A rare aquatic moss, found about 15 cm under water, attached to stonework of Widewater Lock and of Jack's Lock, Harefield, 29.ix.1994.

B *Tortula ruralis* ssp. *ruralis.* Reappearing in the London area as air pollution by sulphur dioxide diminishes. Abundant in localized patch, Denham Quarry, South Harefield, 16.xii.1994; at bus roundabout in Park Lane, Harefield, 14.i.1995.

T. intermedia. By canal verge between Denham Lock and Jack's Lock, Harefield, 5.iii.1992, 12.ii.1994.

BRG *T. muralis.* Very frequent on stone, mortar and brick.

T. marginata. Rare in Middlesex. On brickwork under footbridge in Old Park Wood, 7.v.1994.

B *T. subulata* var. *subulata.* In Tarleton's Lake Nature Reserve, on moist clay bank 10.viii.1992—old vice-county record renewed (*Bull. BBS* **64**:37).

B G *T. latifolia.* On willow in Tarleton's Lake Nature Reserve, 1.x.1994.

B G *Aloina aloides* var. *aloides.* On floor of Springwell chalk quarry, 26.iii.1994.

B *Pottia intermedia.* Among *Brachythecium velutinum* in Copse Wood, 6.x.1994.

BRG *P. truncata.* Frequent on disturbed ground and among other mosses. By Ruislip Reservoir, 30.ix.1993; by path in Copse Wood, with *Pseudephemerum nitidum* and *Bryum rubens*, 26.ix.1994, 11.xi.1994.

G *P. bryoides.* An uncommon ephemeral of basic soil. In thin sward of bus roundabout in Park Lane, Harefield, 30.i.1995.

BR *Phascum cuspidatum.* At path edge in Denham Quarry, South Harefield, with *Pottia truncata* and *Bryum rubens*, 19.xii.1994.

BRG *Barbula convoluta.* Frequent on gravelly soil.

BRG *B. unguiculata.* Frequent on bare soil.

B G *B. hornschuchiana.* Occasional in thin sward and among other small mosses. Ditch in Poor's Field, 26.ix.1994.

B G *B. fallax.* Uncommon. In Poor's Field, 19.viii.1993 and 9.x.1994.

B *B. trifaria.* On wall of Widewater Lock, 5.iii.1992.

B *B. tophacea.* On brickwork of bridge over stream, Swakeleys, 4.xi.1993.

B G *B. vineali*s. On stonework of Widewater Lock, 29.ix.1994.

B G *B. cylindrica.* Occasional. Abundant on old concrete shaded by viaduct, canal towpath near Denham, 5.ii.1994; on rushy shore of Ruislip Reservoir, 19.ii.1994; in Springwell chalk quarry, 26.iii.1994.

BRG *Bryoerythrophyllum recurvirostrum.* By canal towpath near Harefield, 12.ii.1994.

BR *Weissia controversa* var. *controversa.* On floor of Springwell chalk quarry, 26.iii.1994.

B *W. longifolia* var. *angustifolia.* An uncommon moss of disturbed calcareous ground. Several patches on bare soil trampled by cattle, Coppermill Down, Harefield, 2.xii.1994.

Schistidium apocarpum. By canal verge N of Denham Lock, 30.i.1993; gravelly path on Uxbridge Common, 2.i.1995.

BRG *Grimmia pulvinata.* A common moss, but scarce in the area due to lack of rocks and walls. Canal verge N of Denham Lock, 5.ii.1994; in Springwell chalk-quarry, 12.ii.1995.

BRG *Funaria hygrometrica.* Very frequent on bare and disturbed ground.

G *Orthodontium lineare.* An invasive alien from the southern hemisphere, now frequent throughout England. On path, Tarleton's Lake Nature Reserve, 10.viii.1992; on tree bases and stumps, Park Wood, 19.ii.1994; Copse Wood, 12.iii.1994; Old Park Wood, 21.viii.1993, 7.ii.1995.

BRG *Pohlia nutans.* Common. Shore of Ruislip Reservoir, 28.viii.1993; Springwell chalk-quarry, 12.ii.1995.

G *P. lescuriana.* Uncommon but probably under recorded—first recognized as a British species in 1964. On damp clay by stream in Park Wood, 15.v.1994.

BRG *P. carnea.* Occasional on damp clay. By path in Park Wood, 19.viii.1993; on moist chalk in Old Park Wood, 21.viii.1993.

BRG *Bryum capillare.* Common, especially on rocks and walls.

B. subelegans. On decaying stump in Park Wood, Swakeleys, 25.iv.1992.

B. pseudotriquetrum var. *pseudotriquetrum.* Among reeds on E shore of Ruislip Reservoir, 6.xi.1992—new vice-county record (*Bull. BBS* **64**:39).

B *B. pseudotriquetrum* var. *bimum.* Among reeds on E shore of Ruislip Reservoir, 19.ii.1994.

B G *B. caespiticium.* Occasional. Canal verge by Denham Lock, 30.i.1993; floor of Springwell chalk-quarry, 26.iii.1994.

BRG *B. bicolor.* Frequent on bare soil, by paths and by Ruislip Reservoir.

B. gemmiferum. Recognized as a distinct species about 1965. On disturbed ground by canal N of Denham Lock, 1.viii.1992.

G *B. dunense.* This species was first described in 1978. On sandy muddy soil near the 1930s' artificially-created Lido 'beach', Ruislip Reservoir, 19.viii.1993, 30.ix.1993.

BRG *B. argenteum.* Frequent by paths and on bare ground.

B. ruderale. On gravelly chalky soil of bus roundabout in Park Lane, Harefield, 30.i.1995.

G *B. rubens.* Locally frequent on moist clay by paths and rides in Ruislip woods. Park Wood, 16.x.1992, 9.x.1994; Copse Wood, 12.iii.1994; Mad Bess Wood, 1.x.1994, 10.xii.1994, 6.i.1995.

BRG *Mnium hornum.* Frequent at tree bases in woods. Old Park Wood, 21.viii.1993; Mad Bess Wood, 10.xii.1994.

BR *Rhizomnium punctatum.* Occasional. On branch in stream, Copse Wood, 19.viii.1993; by stream in Park Wood, 9.x.1994; by streamlet in Old Park Wood, 7.v.1994.

B G *Plagiomnium affine.* Occasional. By damp path edge, Old Park Wood, 21.viii.1993.

BRG *P. undulatum.* Frequent. Copse Wood, in moist ditch, 28.viii. 1993, on bank of stream, 6.x.1994; Old Park Wood, 7.v.1994; Coppermill Down, Harefield, 29.ix.1994.

BRG *Aulacomnium androgynum.* Frequent on rotting bark.

B *Orthotrichum lyellii.* Rare. On decaying oak branch, copse by Harvil Road, South Harefield, 22.xi.1994.

B G *O. affine.* Occasional. On willow by canal N of Harefield, 10.iv.1992, 26.iii.1994 (Figure 7); on elder by stream, Copse Wood, 12.iii.1994; on leaning ash near pond, Old Park Wood, 21.viii.1993; on willow in Tarleton's Lake Nature Reserve, 1.x.1994; on willows in Denham Quarry, 19.xii.1994.

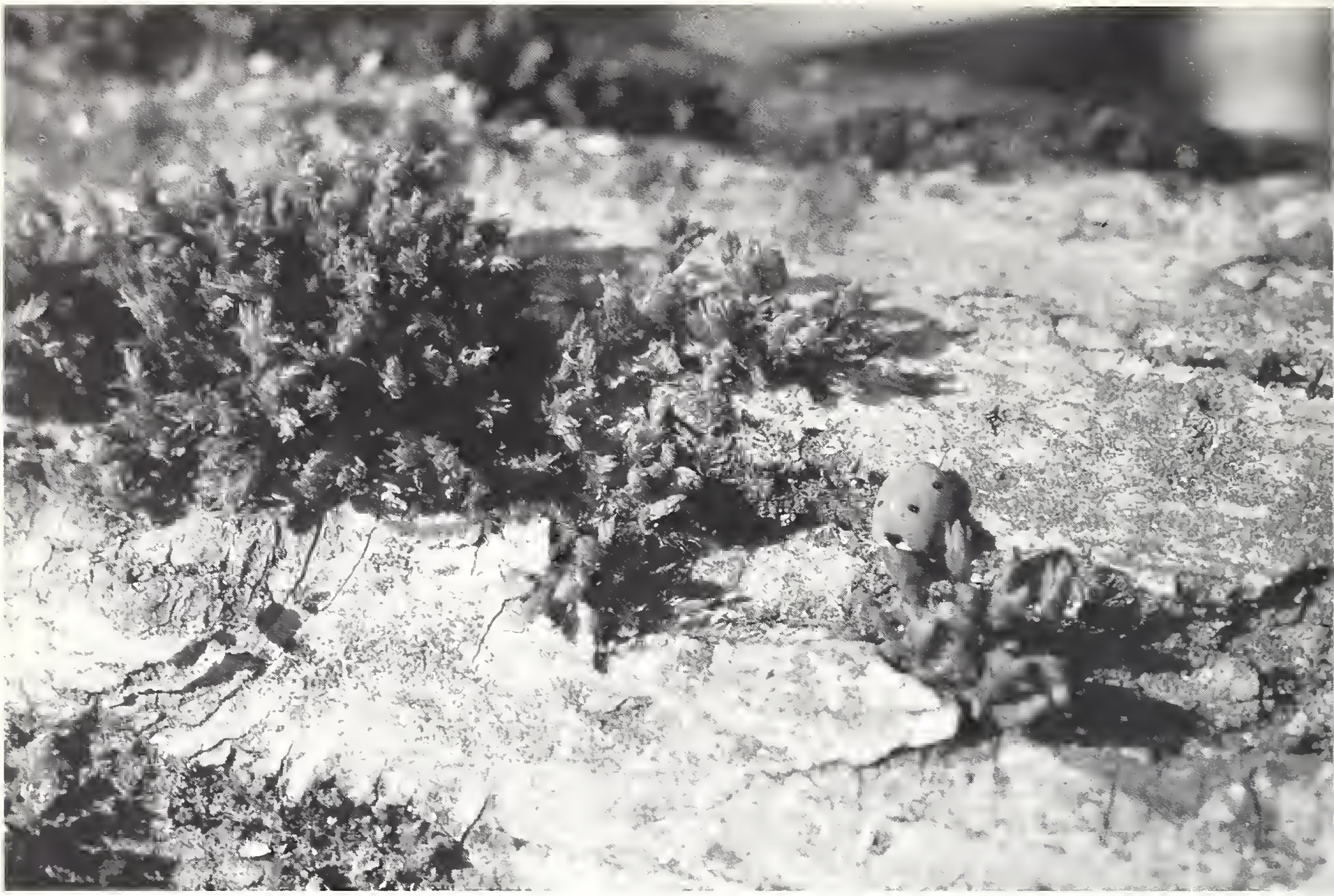


FIGURE 7. *Orthotrichum affine* on bark of old willow near Harefield.

BRG *O. diaphanum.* Occasional. On willows, Swakeleys, 9.vi.1992; Tarleton's Lake Nature Reserve, 1.x.1994; Denham Quarry, 16.xii.1994; on stone and concrete by canal between moor and Denham locks, 5.ii.1994.

O. pulchellum. Uncommon in SE England. On willow by canal N of Harefield, 10.iv.1992—new vice-county record (*Bull. BBS.* **62**:52).

Ulota crispa. Reappearing in the London area as sulphur dioxide air pollution diminishes. On willow by canal N of Harefield, 7.v.1992—old vice-county record renewed (*Bull. BBS* **64**:40); on decaying oak branch, copse by Harvil Road, South Harefield, 16.xii.1994; on willow in Denham Quarry, South Harefield, 19.xii.1994.

U. crispa var. *norvegica* (*U. bruchii*). On willow, Park Wood, Swakeleys, 10.iii.1992.

BRG *Fontinalis antipyretica.* Between Denham Lock and Widewater Lock, in canal overflow outlet S of viaduct, 23.iv.1992; in stream in Copse Wood, 30.vii.1994.

Cryphaea heteromalla. Reappearing due to reduced sulphur dioxide air pollution. On willow by canal N of Harefield, 26.iii.1994; on decaying oak branch, copse by Harvil Road, South Harefield, 22.xi.1994.

B G *Leskea polycarpa.* On willow, Tarleton's Lake Nature Reserve, 1.x.1994; on willow, Denham Quarry, 19.xii.1994.

BRG *Thuidium tamariscinum.* Very sparse in Ruislip woods. Park Wood, 4.x.1993, 9.x.1994; Copse Wood, 11.xi.1994, 6.i.1995.

BRG *Cratoneuron filicinum.* By canal between Denham Lock and Widewater Lock, 10.vii.1992, 30.i.1993, 5.ii.1994, 12.ii.1994.

BR *Campylium chrysophyllum.* In Springwell chalk-quarry, 26.iii.1994, 11.vi.1994.

BRG *Amblystegium serpens.* Widespread, especially on soil in shaded situations.

B *A. tenax.* Found only once. Between Denham Lock and Widewater Lock, in canal overflow outlet S of viaduct, 23.iv.1992.

BRG *A. riparium.* Frequent by canal, ponds and streams. Among reeds by Ruislip Reservoir, 3.xii.1993; on canal bank by Broadwater Farm bridge, Harefield, 12.ii.1994.

B G *Drepanocladus aduncus.* Very local. Among reeds on E shore of Ruislip Reservoir. 3.xii.1993. 19.ii.1994. 15.v.1994. 4.xii.1994.

BRG *Calliergon cuspidatum.* Frequent by Ruislip Reservoir. in Springwell chalk-quarry. and common in damp grassy places.

B G *Isothecium myosuroides.* Frequent at tree bases in Ruislip woods. Park Wood. 24.iv.1994. 15.v.1994. 23.x.1994: Mad Bess Wood. 10.xii.1994. 6.i.1995.

BR *Homalothecium sericeum.* Occasional on stonework or concrete. On gravestones. St Mary's parish church. Harefield: on old concrete steps by Harefield chalk-pit.

BRG *H. lutescens*. In Harefield chalk-pit. 7.v.1992: in Springwell chalk-quarry. 26.ii.1994. 11.vi.1994: on E shore of Ruislip Reservoir. 28.viii. 1993.

BRG *Brachythecium albicans.* Occasional along canal tow-path and in other areas of thin gritty sward.

BRG *B. rutabulum.* Very common.

BRG *B. velutinum.* Occasional. In hedgerow near Coppermill Down. Harefield. 29.v.1993: Old Park Wood. 7.v.1994: in old chalk-pit on Coppermill Down. 30.i.1995: tree base in Park Wood. 26.ix.1994.

BRG *Pseudoscleropodium purum.* Abundant in Poor's Field and on Coppermill Down. and occasional in clearings in Ruislip woods.

B *Scleropodium cespitans.* Occasional. Canal wall N of Denham Lock. 31.i.1993: canal verge N of Widewater Lock. Harefield. 12.ii.1994.

BR *Cirriphyllum piliferum.* Small colony in clearing by stream in Old Park Wood. 2.xii.1994—old vice-county record renewed (*Bull. BBS.* **66**:46).

BR *Rhynchostegium riparioides.* Occasional by canal.

BRG *R. confertum.* Common at tree bases.

BRG *Eurhynchium striatum.* Scarce. E shore of Ruislip Reservoir at edge of Park Wood. 9.ix.1993.

BRG *E. praelongum.* Widespread.

BRG *E. swartzii.* Frequent. By canal N of Denham Lock. 5.ii.1994: by canal S of Harefield. 12.ii.1994: by stream in Copse Wood. 6.x.1994.

G *Rhynchostegiella tenella* var. *tenella.* Scarce. On old concrete in Summerhouse Lane. Harefield. 16.ii.1993: in chalk-pit on Coppermill Down. 30.i.1995.

Plagiothecium latebricola. Rare and found only once. On decaying tree-stump in Old Park Wood. 7.v.1994.

BRG *P. denticulatum.* Occasional at tree bases. Copse Wood. 26.ix.1994.

G *P. curvifolium.* frequent at tree bases and on decaying wood. Park Wood. 4.xii.1994: Copse Wood. 28.viii.1993. 11.xi.1994. 4.xii.1994: Mad Bess Wood. 10.xii.1994: Old Park Wood.7.ii.1995.

G *P. succulentum.* Occasional at tree bases. Park Wood. 16.x.1992.

RG *Isopterygium elegans.* Frequent on moist shaded clay. Park Wood. 23.vii.1993. 15.v.1994. 24.vii.1994: Copse Wood. 12.iii.1994: Bayhurst Wood. 10.viii.1992: Watts Common. Harefield. 30.ix.1994.

BRG *Hypnum cupressiforme.* Widespread.

BRG *H. cupressiforme* var. *resupinatum.* Frequent on tree-trunks. Park Wood. 19.ii.1994: Copse Wood. 19.viii.1993: Old Park Wood. 21.viii.1993.

G *H. jutlandicum.* Frequent in heathy areas and woodland clearings. Park Wood. 9.ix.1993: Poor's Field. among *Calluna* clumps. 9.x.1994.

BR *Ctenidium molluscum.* On Coppermill Down. Harefield (very stunted form). 2.xii.1994.

BRG *Rhytidiadelphus squarrosus.* Frequent in damp grassy places. Copse Wood. 12.iii.1994: Old Park Wood. 26.iii.1994.

BRG *Pleurozium schreberi.* Among *Calluna* clumps in Poor's Field. 13.iii.1994. 9.x.1994.

LIVERWORTS

G *Lepidozia reptans.* Found only once. Copse Wood, in moist ditch, 28.viii.1993.

BRG *Calypogeia fissa.* Frequent in damp ditches and by streams. Park Wood, 23.vii.1993, 4.x1993; Copse Wood, 28.viii.1993, 30.vii.1994, 13.x.1994; Mad Bess Wood, 10.xii.1994 (Figure 8).

G *C. muellerana.* Rare—found only once. Copse Wood, in moist ditch, 28.viii.1993.

G *C. arguta.* Occasional in damp woodland ditches. Park Wood, 23.vii.1993, 15.v.1994, 24.vii.1994.

BRG *Cephalozia bicuspidata.* Locally abundant on moist clay stream-banks. Park Wood, 23.vii.1993; Copse Wood, 19.viii.1993; Mad Bess Wood, 10.xii.1994 (Figure 8).

G *Leiocolea turbinata.* Abundant on floor of Springwell chalk-quarry, 31.viii.1993.

BRG *Jungermannia gracillima.* Occasional. Park Wood, on moist stream-bank, 24.vii.1994.

RG *Scapania irrigua.* Occasional. Park Wood, on banks of dried-out stream, 4.x.1993, 24.vii.1994, 9.x.1994.

B G *S. undulata.* Uncommon. Park Wood, on bank of dried-out stream, 23.vii.1993.

BRG *S. nemorea.* Uncommon. Copse Wood, in damp ditch, 28.viii.1983; Park Wood, on bank o dried-out steam, 9.x.1994.

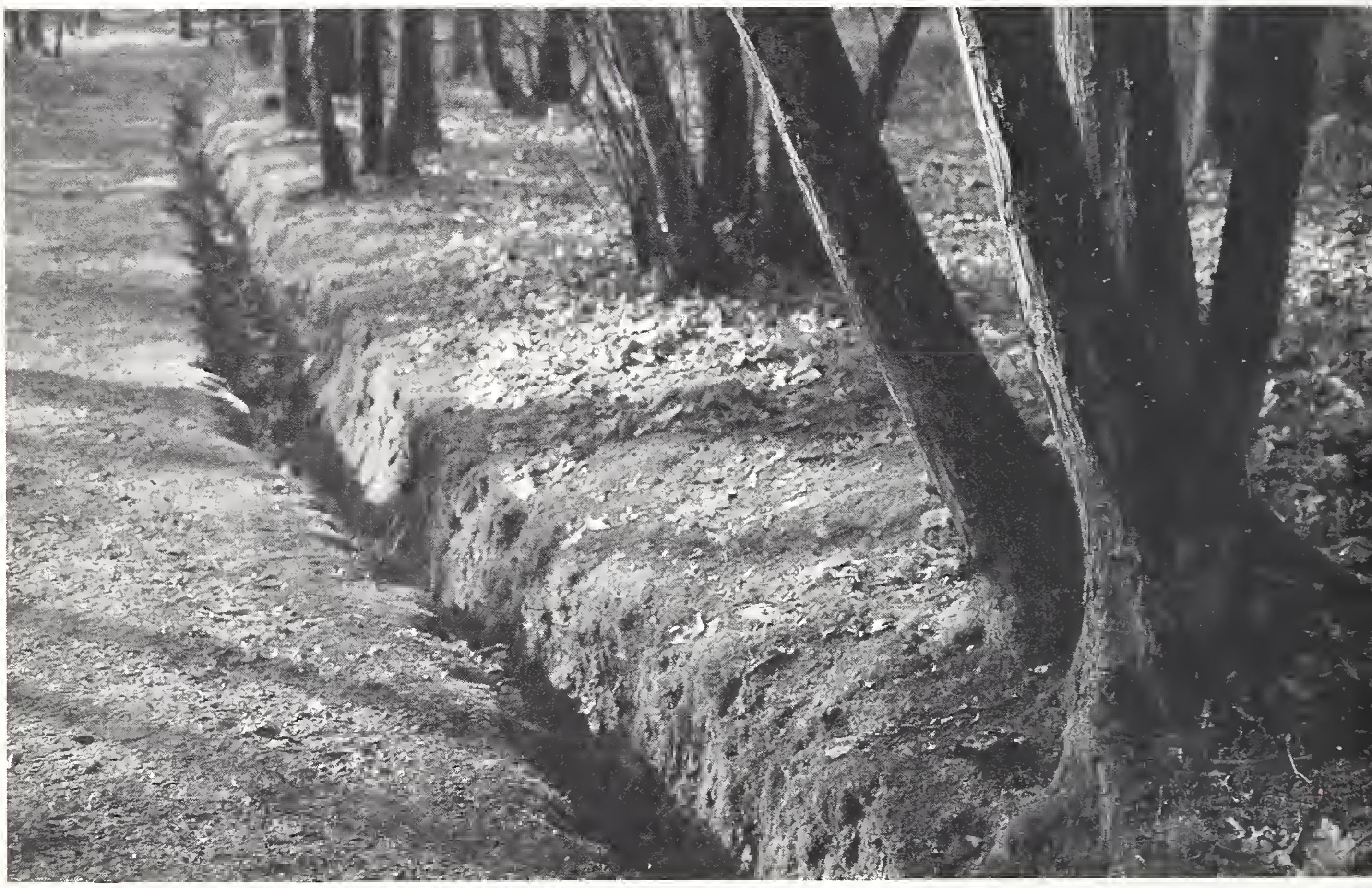


FIGURE 8. The liverworts *Calypogeia fissa* and *Cephalozia bicuspidata* may be found in this ditch in Mad Bess Wood, Ruislip.

BRG *Lophocolea bidentata.* Frequent at tree bases and on rotting wood.

BRG *L. heterophylla.* Frequent at tree bases and on rotting wood.

B G *Chiloscyphus polyanthos.* Uncommon. Copse Wood, by stream, 19.viii.1993; in marshy patch near stream, 6.x.1994. (There is no specimen of this in Benbow's herbarium, but h published it 'from Ruislip woods' in *J.Bot.* **32**:370.)

B G *Frullania dilatata.* Uncommon, but reappearing with reduction in sulphur dioxide air pollution. On decaying oak branch, copse by Harvil Road, South Harefield, 16.xii.1994.

G *Fossombronia pusilla.* Uncommon. Copse Wood, on moist gravelly bank, 13.x.1994.

BRG *Pellia epiphylla*. Frequent on banks of woodland streams.

P. endiviifolia. Abundant on stream-banks in Copse Wood, 19.viii.1983, 26.ix.1994, 6.x.1994; abundant on floor of Springwell chalk-quarry, 21.viii.1993, 31.viii.1993, 26.iii.1994.

B G *Metzgeria furcata*. Abundant on old concrete wall in Tarleton's Lake Nature Reserve, 11.xii.1994.

BRG *Lunularia cruciata*. Locally frequent.

G *Conocephalum conicum*. Uncommon. On stream-bank in Copse Wood, 19.viii.1993.

B G *Marchantia polymorpha*. Occasional.

Riccia cavernosa. Rare in Britain. In abundance on sandy muddy W shore of Ruislip Reservoir, 19.viii.1993—new vice-county record (*Bull. BBS* **64**:33).

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Book reviews

European mammals: evolution and behaviour. David Macdonald. HarperCollins, London. 1995. 352 pp. £14.99 (hardback). ISBN 0 00 219944 0.

The easiest way of beginning this review is to come straight to the conclusion — this is the mamma book of the year and is essential reading for anyone interested in this group of animals.

The book is written by David Macdonald from Oxford University, who is an international expert o mammals, especially carnivores, and is attractively illustrated by Priscilla Barrett. As might be expected from the subtitle, the drawings show some part of the animal's behaviour and, unlike som other books, they really do complement the text. It is intended as a companion book to the earlie Collins *Field Guide to mammals of Britain and Europe* which is itself an integral part of ever mammalogist's library.

The book is divided in to four parts: evolution, behaviour, reproduction, and conservation. Although examples are drawn from mammals across Europe, there is plenty of interest to British workers. Perhaps predictably, I read the book from cover to cover, but the text is so readable and accessibl that I can envisage dipping in to the book on many future occasions. The final section on conservatio is particularly valuable as our mammals come under increasing pressure throughout much of thei range in Europe.

European mammals deserves to be widely read and a financial success for the publishers, for i stands head and shoulders above most other mammal books produced in the past few years. Th advice of this reviewer is unambiguous — buy your copy today.

CLIVE HERBER

Solitary wasp. Peter F. Yeo and Sarah A. Corbet. Naturalists' Handbooks 3, secon edition, revised. 1995. 68 pp. £7.95 paperback, ISBN 0 85546 295 7, £13 hardback, ISB 0 85546 296 5.

Insects and thistles. Margaret Redfern. Naturalists' Handbooks 4, second edition, revised 1995. 70 pp. £7.95 paperback, ISBN 0 85546 297 3, £13 hardback, ISBN 0 85546 298 1

These two titles first appeared in 1983, and after the series reached No.7, Richmond Publishin took over Cambridge University Press. To date twenty-one titles have appeared and most have bee reviewed in *The London Naturalist*. The series is aimed at a broad range of readership, fron inexperienced naturalists to school and university students and professional ecologists. All are writte by specialists and have been highly recommended by our reviewers. These second editions have bee substantially revised to bring them up to date and to incorporate fresh discoveries in the intervenin years. The illustrations in colour and black and white by Anthony J. Hopkins are excellent and greatl enhance the texts, both in the introductory sections and the identification keys.

I recommend that anyone not familiar with the series visits their local bookshop or writes to Th Richmond Publishing Co. Ltd, P.O. Box 963, Slough SL2 3RS, or phones them on 01753 643104 fo details of the series.

K. H. HYAT

Fungi in London: some highlights over two hundred years

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Summary

In 1996, the British Mycological Society reaches its centenary, and a Grand Conversazione in London, open free to all comers, will be one of its celebrations to mark the event. The same year represents a bicentenary of the greatest London mycologist of his day, James Sowerby, then at the height of his powers, with many years' experience as a collector of fungi. These two facts have induced me to write this short article.

Mycology is the study of fungi, though the word is not universally understood. The word 'fungology' was once used but fortunately disappeared in the last century. Most of us know what fungi are. It is however desirable to remind ourselves that fungi divide into two groups on the ground of size: the first are readily visible to the naked eye and the second are of microscopic dimensions. The first, the 'larger fungi', include the mushrooms and toadstools, the bracket fungi and a diversity of fungi in the lower part of the size range, some known as cup fungi, but others with no colloquial English collective, mainly belonging to a class whose anglicized name is the 'ascomycetes'. The second, the microscopic fungi, includes those causing plant disease — rusts, smuts, mildews and others, and those of saprophytic, and of other, diverse, activities, the moulds and yeasts. The larger fungi are readily studied by the naturalist, but the second group requires possession of a microscope: the first fits readily into the science of botany, but the second fits better into microbiology. As ever in biology, intermediates join the two groups.

Two hundred years ago — which, to give a sense of distance in time, is some years before the Battle of Trafalgar — James Sowerby, an illustrator by profession, began to make models of the larger fungi. In 1796 he published the first of the thirty-two numbers which made up his great work *Coloured illustrations of English fungi*, and on its wrapper he noted 'it was not the Author's intention to have published this work, till he had nearly finished a laborious undertaking in which he has for some time been engaged, the making of coloured models of English Fungi in their different states, and thus as much as possible ascertaining and fixing the limits of each species . . . But that project being very extensive, it has been thought proper to begin publishing such as are least doubtful, in hope that in the mean time a more perfect knowledge may be daily acquiring of such as are to be given to the world hereafter . . .' Sowerby persevered with the models whilst he continued to prepare illustrations: in 1809 he wrote 'I intend to finish models of the more particularly poisonous Fungi, and of those which are edible, to prevent, as far as possible, future mistakes, for the use of the Public, and request those who have opportunities to help in this investigation, to favour me with information . . . Every Clergyman, Gentleman, Physician and Apothecary, or public character looked up to for information, throughout the kingdom, should get acquainted with [the fungi] for this philanthropic purpose; for which, and for other useful purposes, I have long kept my Collection open for public inspection every first and third Tuesday in each month, from Eleven until Three o'Clock'. Sowerby lived at No.2 Mead Place, Lambeth. His models were displayed in a room behind the house, and were later joined by a collection of British minerals and another of British birds, for Sowerby was the complete naturalist.

Sowerby knew his fungi about London: thus of *Agaricus* (now *Volvariella*) *volvaceus:* 'Found in great plenty in the bark-beds of hot-houses about London in the year 1785 . . . the same year I met with it in a lane about Peckham . . . on 21 August 1795 I found [a specimen] in Earl Spencer's Park at Wimbledon . . . it grew on a very rotten stump of a Lime-tree'. Of *Phallus impudicus:* 'We have found this Fungus in most woody places where we have been about London, as in Kensington Gardens . . . and of *Phallus* (now *Mutinus*) *candidus:* 'This curious little plant is more rare than the above. I have seen it at Hampstead in Lord Mansfield's wood, where Mr Hunter the gardener finds it annually . . .' The 'mistake' noted in the above paragraph referred to a fatality at Mitcham. On another occasion, in the Green Park, Sowerby met a nursery-maid, who, seeing him a little curious, asked him about some mushrooms. Sowerby advised her that they were not to be eaten, 'she was, however, confident in her own opinion, that they were good to eat; but I had the satisfaction to see her throw them away when at some distance from me.' Sowerby knew some microfungi, too. Interspersed with his illustrations of larger fungi are many ascomycetes, shown as spots on living plants or pieces of wood or straw, and also drawn at hand-lens magnification. A few moulds are similarly illustrated, notably *'Mucor urceolatus* = *Pilobolus,* on dung.

Sowerby's models were sold by his son to the British Museum (in Bloomsbury) in 1844. Just before this time, interest in gardening in its widest sense had given rise to two London journals: the *Gardeners' Chronicle and Agricultural Gazette* in 1841 and the *Journal of the Horticultural Society* in 1845 (*Royal Horticultural Society* after 1866). This was at the time of the great potato murrain which led to famine in Ireland, and early articles in these journals discussed the cause of this disaster with Berkeley's paper (*J.hort.Soc.* **1**: 9–34, 1846) attributing it to the fungus *Botrytis infestans* Montagne. These journals contained a proportion of articles on diseases of plants caused by microscopic fungi, including several translated from other European languages, for the Continental scientists were ahead of Britain in the study of microscopic fungi. The Revd M.J. Berkeley, the leading British mycologist of the nineteenth century, and a Northamptonshire man, was editor of the *Journal of the Royal Horticultural Society* from 1866 to 1877. He had contributed many articles in a series 'Decades of Fungi' to another London journal, the *London Journal of Botany*, over the years 1842–1848. He continued to do so after the journal changed its name to *Hooker's Journal of Botany and Kew Garden Miscellany* until the journal was reformed under the title *Journal of Botany, British and Foreign* in 1863. Thereafter, a single series of 'Decades of Fungi' was written in 1866 by M.C.Cooke.

Mordecai Cubitt Cooke was a Norfolk man who came to London in 1844; his fascinating life story has been told by English (1987). He taught at Holy Trinity School in Lambeth from 1851 until 1860, and in 1862 became an assistant at the India Museum in Whitehall. In his spare time he developed his interests in natural history in general and in fungi in particular, writing his first book on the fungi, *The plain and easy account of British fungi,* in 1862. This ran to sixteen reprints and editions. Cooke continued at the India Museum for eighteen years, spending more and more spare time on the fungi, until he was seconded part time to Kew and could pursue his interest in the fungi professionally. Noting that there was no British journal devoted to cryptogamic botany, and with the existing journals 'giving the cold shoulder to cryptogamic communications', Cooke founded his own journal *Grevillea* in 1872, which was published in London until 1894. He wrote some forty works on various aspects of natural history and microscopy, including sixteen on fungi. At the age of seventy-one he became a founder member of the British Mycological Society, which was formed, in Yorkshire, in 1896.

The other principal writer on fungi in the *Journal of Botany* was Worthington George Smith. He was a Londoner born in Shoreditch. Smith was trained as an architect and became a professional illustrator. He became interested in the fungi at an early age, and, like Cooke, was self taught. Smith's interests also extended from the larger to the microscopic fungi; and in 1875 he claimed to have discovered the resting spores of the potato blight fungus, for which many professionals had searched since the fungus was described by Montagne. Here, however he came into conflict with one of the greatest Continental professionals of the century, Professor Anton de Bary of Strasburg University. De Bary subjected Smith's published results to searching criticism — 'let me then examine closely and critically the statements of Mr Smith', and showed that Smith's resting spores really belonged to another fungus which had contaminated Smith's microscope preparations. The story is delightfully told in *The advance of the fungi* (Large 1940). Smith later wrote his *Diseases of field and garden crops: chiefly such as are caused by fungi* (1884), in which he still maintained his discovery of the sexual spores of the potato blight fungus for which 'the Royal Horticultural

Society awarded us their Knightian medal in gold' (he used the royal 'we' throughout his book). Smith prepared all the drawings in his book himself: possibly with de Bary at the back of his mind he noted in his preface: 'We hope the illustrations will be useful; we believe they are correct; they show what we have seen, or think we have seen.

It was Worthington G. Smith who renovated the Sowerby models for the British Museum (Natural History) (Carruthers 1888). These had duly been transferred from Bloomsbury to South Kensington after the new Natural History Museum (NHM) was opened in 1881; however, in 1888 they 'were in a very mutilated condition' (Smith 1888). Not only was the collection by now somewhat incomplete, due to their fragile nature from being largely constructed from unburned pipeclay, but the colours of many had altered due to exposure to the London atmosphere 'such as to mislead those who viewed them'. Following their repair by a formatore from Brucciani's, W.G.Smith repainted and remounted the models. He did this with Victorian thoroughness. Noting Sowerby's deficiencies in merely fixing his models, without consideration of their natural habitat, on to sanded blocks of wood surrounded by decorative moss, he remounted them naturally, with real dead branches, horse dung, fir cones, etc. as was appropriate to their habitat. Smith also prepared for the Museum large sheets of coloured illustrations showing how easily to distinguish the differences between edible and poisonous fungi, which Carruthers (1888) praised as 'more efficiently accomplishing Sowerby's object'. In 1893, Smith prepared for the Museum his guide to the Sowerby models. He became president of the British Mycological Society (BMS) in 1904. Smith revised his guide in 1908 and in 1923 Ramsbottom rewrote it as a book whilst retaining the form and arrangement of the original guide. Ramsbottom was general secretary of the BMS from 1921 to 1945 and president in 1924 and 1946, the Society's jubilee year. In 1930 he became Keeper of Botany at the NHM. He was interested in every aspect of fungi and up to and including the war years he gave many talks at the Museum and to natural history and scientific societies on fungal topics. 'Edible and Poisonous Fungi' was a constantly-repeated talk, and Ramsbottom published a booklet on each of these two 'categories' of fungi in the King Penguin series during the war years. His *magnum opus* was his *Mushrooms and toadstools* published in Collins' New Naturalist series in 1953. In 1940 Ramsbottom's Department of Botany was badly damaged by fire and water as a result of an air raid and further damaged by a flying bomb in 1944. It remained closed until 1962, when it was reopened in a much changed and more modern form. The fungi, as the plants, were exhibited not primarily for themselves but as units in ecological systems. The models had gone. Smith's coloured prints had gone. They were replaced, in their ecological settings, by real, freeze-dried specimens — some of whose colours have changed by fading as had Sowerby's pigments from the London air. In 1969, the herbarium collections of fungi were transferred from South Kensington to the Royal Botanic Gardens at Kew, in exchange for the bryophytes, algae and lichens then residing in the Kew herbaria (Stearn 1981). The herbaria of myxomycetes, however, stayed in South Kensington.

Two groups which borderline the fungi are the myxomycetes and lichens, both being within the province of the BMS, although a separate British Lichen Society was formed in 1958. M.C.Cooke was interested in myxomycetes, sufficiently to learn enough Polish to translate those parts of Rostafinski's 1875 treatise on myxomycetes which dealt with the British species. The collections of myxomycetes in the NHM Botany Department were studied from 1887 by Arthur Lister and then by his daughter Gulielma. Arthur Lister was not only an amateur, having been in the wine trade, but worked in the Museum in an unofficial capacity. He produced for the Museum his *Monograph of the Mycetozoa* — he used the zoological synonym of myxomycetes for the title of his book. Lister became president of the BMS in 1906. His daughter, who also worked unofficially in the NHM, produced second and third editions of the *Monograph* in 1911 and 1925. She was president of the BMS both in 1912 and 1932. Gulielma Lister joined the London Natural History Society in 1927 and gave a paper on 'Palms and Angels' in the same year, but although a member until her death in 1949 she did not write on myxomycetes. J. Ross contributed two papers to *The London Naturalist (LN)* on 'mycetozoa', in 1938 and 1945, from surveys of Limpsfield Common and Epping Forest respectively, noting in his second paper how helpful

Miss Lister had been to him. Bruce Ing contributed a major article on the myxomycetes (Ing 1965). Annie Lorrain Smith did for lichens what Gulielma Lister did for myxomycetes, in remarkable parallel. Miss Smith was an unofficial worker at the NHM, she twice became president of the BMS (1907 and 1917) and she completed another's (The Revd Crombie's) work, *A monograph of British lichens,* later producing a second edition of his first volume.

Not very much work on fungi is reported in the *LN*. The botanist J. E. Lousley listed fungi in the Limpsfield Common Survey in 1937 and 1939, and in 1945 G. C. Ainsworth, then secretary of the BMS and assistant mycologist at the then Imperial Mycological Institute at Kew, wrote an addendum, on the larger fungi, to the Survey of the Cuckoo Pits area o Epping Forest. John Ramsbottom gave a talk on 'Mushrooms and Toadstools' to the Societ in 1933, but was not a member. Indeed notwithstanding the central interest in fungi a London's NHM during Ramsbottom's long reign, there is hardly mention of fungi in the New Naturalist volume of 1945 on *London's natural history* by Richard Fitter. Fitter, very active member of the London Natural History Society, was primarily an ornithologis although his book encompassed a good deal of botany and general natural history. The only mention of fungi is a note that by 1945 mushrooms had been exterminated from man fields near London by people with a taste for the only fungus that it is at all widely eaten i modern Britain! Fungi were recorded by C. P. Castell during the Bookham Common survey with help from the BMS. A recent major paper on fungi was Keith Thomas's nine-yea study of urban fungi in Haringey (Thomas 1992). Peter Holland has prepared a thirty-pag summary account of the fungi of Bookham Common, but unfortunately this is as yet onl of restricted circulation. Lichens have fared better than fungi in the *LN*, with several article down the years; in the nineties there is a recorder for lichens but not for fungi.

As noted above, the fungal collections formerly in the NHM are now at RBG Kew which is within the 10-mile radius roughly corresponding with inner London. Broadly RBG Kew deals with matters concerning the larger fungi, whereas the microfungi are th province of the Mycological Institute. Founded at Kew in 1920 as the Imperial Bureau o Mycology, primarily for the purposes of applied mycology with particular reference t plant diseases in Britain and the Empire, it became the Imperial Mycological Institute i 1930, the Commonwealth Mycological Institute in 1948, and the International Mycologica Institute in 1990 (Aitchison and Hawksworth 1993). In 1993, to accommodate expansion it moved from Kew to Egham — just on the 20-mile radius which represents the territor of London for the London Natural History Society and in Fitter's *London's natural histor* The Institute has contributed eight presidents to the BMS.

Mycology has been studied in the University of London since about the time of th Great War. William Brown developed a world-renowned school of plant pathology a Imperial College, initiating a long series of papers on physiology of parasitism which ra in the *Annals of Botany* from 1916 until after he retired in 1953 (to which the presen author, as a Ph.D. student of Brown, contributed No. XIX). The author was stimulated t study mycology by the lectures of Bertie Frank Barnes at Chelsea Polytechnic in 1945–7 Helen Gwynne-Vaughan and Terence Ingold at Birkbeck College, George Smith at th London School of Hygiene and Tropical Medicine, and Helen Gwynne-Vaughan an Elizabeth Blackwell at the Royal Holloway College have all taught mycology in Londo with distinction. All the above teachers have attained the presidency of the BMS.

In 1983, the author enquired of the NHM as to the fate of the Sowerby models and wa invited by the then Keeper of Botany, Mr John Cannon, to inspect them. He found they ha suffered a catastrophe worse than that which had faced Worthington Smith in 1888. Fro the ruins of the Botany Department after the war fewer than thirty of the original some 20 models had been rescued, and these were stored in cardboard boxes in the Lichen Section The remnant was not suitable for exhibition in a modern gallery. Some of these histori models will be shown, by kind permission of the present Keeper of Botany, Dr Stephe Blackmore, at the Grand Conversazione.

The British Mycological Society's Grand Centenary Conversazione will be held in th Old Hall of the Royal Horticultural Society in Vincent Square, Westminster, over thre days from 26–28 September 1996. London's mycology will be represented in force: certainl y RBG Kew, IMI Egham, LNHS, and several Colleges of London University. Fungus emonstrations will come in from all over the country, with some from overseas. One undred exhibits are expected. There will be popular lectures, slides, videos, gastronomic xperiences of fungi. Do come with all your friends to celebrate the Fungi in London.

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Book reviews

The pocket guide to mammals of Britain & Europe. A.M. Hutson. Dragon's World, London, in association with The Wildlife Trusts. 1995. 184 pp. £7.95 (spiral-bound with additional glossy dust-jacket). ISBN 1 85028 224 2.

This reasonably priced publication is intended to be a field guide and covers the vast majority of species likely to be encountered. A few species, such as Chinese water deer, which has a highly restricted distribution in Europe, receives only a brief mention under another similar species. This is understandable in order to save space, but does raise the question as to why a full page was able to be allocated to both the domestic horse and domestic donkey. This space could surely have been better used!

Each species is described under the headings of size, weight, identification, range, habitat, behaviour, breeding, food, conservation, and similar species (if appropriate). These give sufficient information to achieve identification, although it is a shame that the section on conservation was not given for each species. Another minor irritation is that species are not in the same taxonomic order as in *The handbook of British mammals*, and some names are expanded, for instance, to become western hedgehog and Eurasian common shrew.

These comments should not, however, detract from the usefulness of this book which far exceeds some other recent publications, such as Paul Morrison's *Mammals, reptiles & amphibians of Britain and Europe*. Unlike the latter book, I failed to locate any factual errors and the illustrations were of a generally high standard showing the key features of each species. As an introductory guide, this book can be thoroughly recommended for the general naturalist to add to his or her library.

CLIVE HERBERT

A short history of the wolf in Britain. James Edmund Harting. 1880. 91 pp. Pryor Publications, Whitstable. 1994 (facsimile). £5.95. ISBN 0 946014 27 2.

This book by a well-known Victorian naturalist who was the author of *The birds of Middlesex* (1866), Britain's first county avifauna, was published in 1880. It comprises a section from a larger work, *British animals extinct within historic times.*

That work is still quoted in the current *Handbook of British mammals*, the mammalogist's bible, as the standard reference source for historical records of the species. The latest thinking on references to wolves in place-names is shortly to be published in the journal *Mammal Review*, and it will be interesting to compare the new paper with the details given by Harting.

The book provides a fascinating account of mediaeval times, as well as documenting the demise of wolves in England (1485–1509) and Scotland (1743). The wolf was the last British mammal to become extinct until the loss of the mouse-eared bat *Myotis myotis* in 1991. The centuries-old attitudes which led to the extinction of the wolf still, sadly, persist in northern Scandinavia and the ranching country of America.

Readers looking for a detailed natural history of the wolf will be disappointed, but that was not, of course, the objective of the book. It is a somewhat difficult read, with a few quoted Latin paragraphs breaking the flow of the text. The book does, however, deserve to be available to a wide readership and it is to be hoped that the publishers will bring out the other sections on bear, beaver, reindeer and wild white cattle from the original publication.

CLIVE HERBERT

The flora of the Brent Reservoir, Middlesex

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Abstract

survey of the vascular plant flora of the Brent Reservoir and adjacent open spaces was undertaken etween 1983 and 1995. A list of species recorded, together with earlier records from a variety of ources is presented. The Reservoir was created in 1835 in an area of rural farmland, which has since een used for a variety of residential, industrial and recreational purposes. These changes continue to nfluence the flora of the Reservoir, and in particular, there were many introduced species. The flora of he marshland, wet willow woodland, exposed alluvium, and of grasslands on gravels around the eservoir were noted. Other communities included remnant hedgerows, scrub woodland, rough ground n former rubbish tips and rough grassland. During recent decades the willow woodland has increased n the marshlands.

Introduction

The Brent Reservoir, also known as The Welsh Harp (Frontispiece), was constructed by damming the River Brent in about 1835 (Hewlett 1985, Wembley History Society 1985). The Reservoir was constructed to supply water to the Grand Junction Canal (Regent's/ Grand Union Canal), but is now used for recreation, wildlife conservation and for flood control for an urban catchment area of 78 km^2. The headbank dams two rivers, the Dollis Brook from the east and the Silk Stream from the north, which converge within the Reservoir to form the River Brent (Figure 1). Evidence from Ordnance Survey maps suggests that the Reservoir, which was extended after 1851, exceeded 80 hectares in the late nineteenth century, at which time both of the two arms extended well back along the two river valleys, east of the Edgware Road. However, due to urbanization and siltation, the area of open water is now approximately 51 ha. The main arm of the Reservoir covers approximately 44 ha and the northern arm covers 7 ha. The depth of the water does not exceed 8 metres, even above the sluice outlet at the dam wall, and the average depth is estimated at approximately 2.5 m. The Reservoir itself is owned by the British Waterways Board. Both the London Boroughs of Brent and Barnet own parkland adjacent to the Reservoir in their respective boroughs. Much of the other land near to the Reservoir has been developed for housing and industry.

The geology of the Reservoir basin is predominantly of London Clay, though there is a band of Taplow Gravel around part of the Reservoir perimeter. The damming of the gradually sloping land, which was previously of riverside pasture and meadow, created a considerable area of shallow water, particularly in the eastern and northern arms of the Reservoir. This created new habitats for bird and plant life, and the changing bird life of the Reservoir from 1833 to 1970 was described by Batten (1972). The flooding of the rural river valley was followed in the twentieth century by urbanization of the surrounding area, until the only remaining open land was urban parkland (Batten 1972), and whilst many farm hedgerows have been lost, there has been an increase in secondary woodland, particularly along the marshland edges and on wasteland. These changes have resulted in the introduction o many plant species, some of which have become established.

The Reservoir and marshland were designated as a Site of Special Scientific Interest o account of the breeding wetland birds, the diversity of wintering waterfowl and the variet of plant species growing along the water margin (Nature Conservancy Council *c.*1986). I is also a Site of Metropolitan Importance for nature conservation in London (Greater Londo Ecology Unit 1987). A further description was given by Johnston (1990). The soils of th Reservoir area were mapped by Hollis (1992).

The flora of the Reservoir area was first noted in Trimen and Dyer (1869), and thei records reflect that of the then rural area. Other records have been reported in *The Londo Naturalist* during recent decades, and by Kent (1975) and Burton (1983). Salisbury (1921 described the vegetation which grew on the exposed Reservoir floor during a drought i 1919. Botanical survey work has also been undertaken in the grounds of the Welsh Har Field Centre, and by the Welsh Harp Conservation Group 1971 and 1981. John White curator/botanist of the Westonbirt Arboretum surveyed and noted the willows of th Reservoir area in 1982. Ward and Pilcher (1989) described the vegetation of the Reservoir though their list of the flora appeared to be an unchecked compilation of previous lists Surveys of the flora of the Reservoir were undertaken during the 1980s and early 1990s. I would appear opportune to review and publish these records, for the benefit of futur recorders.

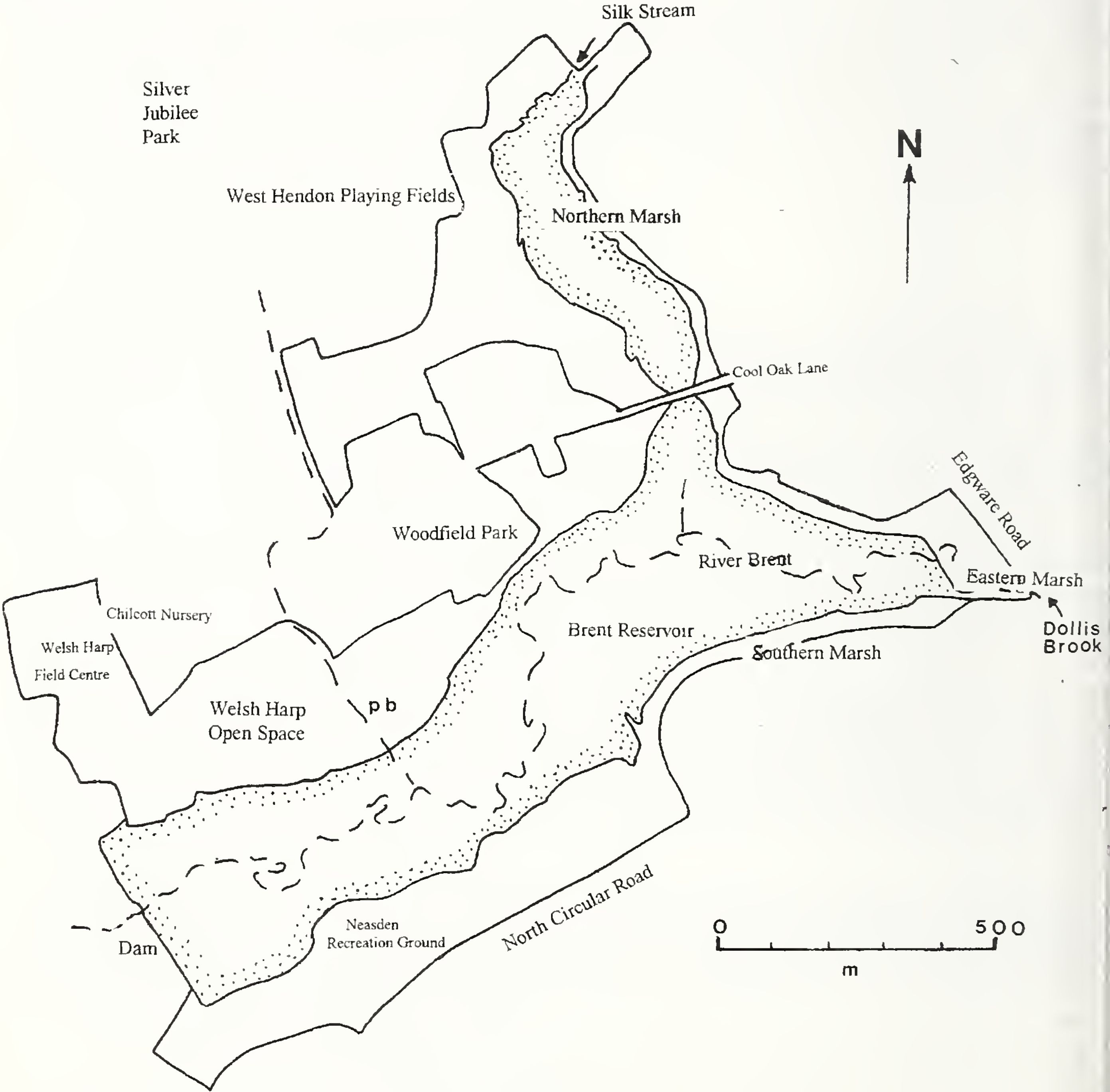

FIGURE 1. Sketch map of the Brent Reservoir and adjacent open spaces. Refer to the text for details o those areas that were included in the survey. The parish boundary is indicated by pb.

Methods

The survey was centred on the Reservoir including the adjacent wetlands and open spaces o the south and the north. These open spaces were Neasden Recreation Ground on the southern side of the Reservoir, and the Welsh Harp Open Space, Woodfield Park and West Hendon Playing Fields to the north of the Reservoir. The grounds of the Welsh Harp Field Centre were included, as were areas of wasteland between the Reservoir and the Edgware Road. Hedgerows in Silver Jubilee Park, adjacent to the West Hendon Playing Fields were ncluded, but the amenity and sports grasslands there were not otherwise surveyed. Excluded from the survey were all allotment sites (at Birchen Grove and Cool Oak Lane), nurseries at Birchen Grove and Wood Lane), school fields, and sports pitches at Woodfield Park.

The survey was undertaken between 1983 and 1995 inclusive. Much of the survey was undertaken during opportunistic visits by LRW, while a more systematic series of visits was undertaken during 1994 by all three authors. The results also noted records made by other recorders and those published elsewhere. Species records from earlier sources were reviewed and several unconfirmed records were excluded. The order and scientific names of species follows Stace (1991).

Results

Species listed below were recorded during the survey from 1983 to 1995, unless otherwise stated. Dates and/or references are given for records by other recorders, for records before 1983 or where the dates were notable. A subjective indication of frequency is given using the ACFOR scale of abundant, common, frequent, occasional and rare. It was obvious from the large number of casual, persistent and naturalized species, that much of the flora of the Reservoir had been introduced. Since it would be unrealistic to separate the various ntroductions, all species recorded during the survey are listed:

Equisetum arvense field horsetail: damp grassland by path near eastern marsh.
Pteridium aquilinum bracken: dam embankment.
Phyllitis scolopendrium hart's-tongue: rare on stonework on southern side of eastern marsh (L. Batten).
Dryopteris filix-mas male-fern: frequent in marsh and wet woodland.
Dryopteris dilatata broad buckler fern: occasional in wet woodland in southern marsh.
Taxus baccata yew: occasional in scrub and hedgerows.
Caltha palustris marsh marigold: occasional in wetland, but not recorded since 1983.
Aconitum napellus monks-hood: rare; 1971 record by Welsh Harp Conservation Group.
Ranunculus acris meadow buttercup: common.
Ranunculus repens creeping buttercup: common in marshland and grasslands.
Ranunculus bulbosus bulbous buttercup: occasional in grassland.
Ranunculus sceleratus celery-leaved buttercup: occasional in shallow wetland and on exposed alluvium.
Ranunculus lingua greater spearwort: rare, in northern marsh.
Ranunculus ficaria lesser celandine: occasional in wet woodland, hedgerows and rough grassland.
Aquilegia vulgaris columbine: rare, probably naturalized, in eastern marsh.
Papaver somniferum opium poppy: occasional on disturbed ground and former rubbish-tip.
Papaver rhoeas common poppy: rare, roadside.
Papaver dubium long-headed poppy: recorded by Welsh Harp Conservation Group, 1981.
Papaver argemone prickly poppy: historical record in Kent (1975).
Fumaria officinalis common fumitory: historical record in Kent (1975).
Platanus x *hispanica* London plane: planted.
Ulmus procera English elm: frequent in hedgerows.
Humulus lupulus hop: occasional in marshland and on rough ground.
Morus nigra black mulberry: planted.
Ficus carica fig: planted.
Urtica dioica common nettle; common in wetland and other habitats.
Nothofagus obliqua roble: assumed to have been planted, Welsh Harp Open Space.
Quercus robur pedunculate oak: common in hedgerows and scrub.
Betula pendula silver birch: frequent as a planted tree and naturalized in woodland at the Welsh Harp Field Centre.

Betula pubescens downy birch: planted at Neasden Recreation Ground.
Alnus glutinosa alder: frequent in marshland, though several of the trees are of planted origin.
Alnus cordata Italian alder: planted at the Welsh Harp Open Space.
Carpinus betulus hornbeam: planted,
Corylus avellana hazel: occasional in hedgerows.
Chenopodium glaucum oak-leaved goosefoot: recorded from 1921, it was abundant along the shore in 1949, though apparently declined in abundance; the last record was in 1971. See Kent (1975) and Burton (1983).
Chenopodium rubrum red goosefoot: occasional, on rough ground and on dried alluvium. Salisbury (1921) noted that it covered over 70 per cent of the mud floor of the Reservoir during the drought of 1919.
Chenopodium polyspermum many-seeded goosefoot: occasional, on dried alluvium.
Chenopodium ficifolium fig-leaved goosefoot: recorded by Welsh Harp Conservation Group in 1971 and by J. E. Lousley in 1949.
Chenopodium album fat-hen: recorded at the Welsh Harp Field Centre 1980 and on exposed Reservoir alluvium in 1919.
Atriplex prostrata spear-leaved orache: occasional, rough ground.
Atriplex patula common orache: recorded at the Welsh Harp Field Centre, 1980; and on exposed Reservoir alluvium in 1919 (Salisbury 1921).
Stellaria media common chickweed: frequent.
Stellaria holostea greater stitchwort: occasional in rough grassland and scrub.
Stellaria graminea lesser stitchwort: frequent in wetland, rough grassland and on crushed rubble.
Cerastium fontanum common mouse-ear: common in grassland including grasslands on gravels and on crushed rubble.
Myosoton aquaticum water chickweed: recorded on exposed alluvium in 1919 by Salisbury (1921).
Sagina procumbens procumbent pearlwort: recorded at the Welsh Harp Field Centre in 1980.
Scleranthus annuus annual knawel: historical record in Kent (1975).
Silene latifolia white campion: recorded by the Welsh Harp Conservation Group, 1981.
Silene x *hampeana* (*Silene latifolia* x *S. dioica*): recorded at the Welsh Harp Field Centre, 1980.
Silene dioica red campion: frequent in marshland, on rough ground and on dried alluvium.
Saponaria officinalis soapwort: rare.
Persicaria amphibia amphibious bistort: frequent in marshland and in some rough grasslands.
Persicaria maculosa redshank: frequent in marshland and on rough ground. In 1990 it covered approximately 90 per cent of a bund containing dried alluvium from the Reservoir.
Persicaria lapathifolia pale persicaria: recorded by Welsh Harp Conservation Group, 1971.
Persicaria hydropiper water-pepper: frequent in the eastern and northern marshes.
Polygonum aviculare knotgrass: frequent in rough grassland and on rough ground.
Fallopia japonica Japanese knotweed: common in the willow carr and woodlands of the eastern and northern marshes, and on rough ground.
Fallopia sachalinensis giant knotweed: noted by Kent (1975).
Fallopia convolvulus black-bindweed: rare, in woodland following coppicing of oak scrub (E. Holmquist).
Rumex acetosella sheep's sorrel: largely confined to grasslands on gravels.
Rumex acetosa common sorrel: occasional, but more common in grasslands on gravels.
Rumex hydrolapathum water dock: recorded by Welsh Harp Conservation Group, 1981.
Rumex cristatus Greek dock: rare on rough ground of former rubbish-tip at West Hendon.
Rumex crispus curled dock: common in rough grassland and on rough ground.
Rumex conglomeratus clustered dock: occasional in wetland.
Rumex x *wirtgenii* (*R. conglomeratus* x *R. palustris*): recorded by Welsh Harp Conservation Group, 1971, See also Kent (1975) and Burton (1983).
Rumex sanguineus wood dock: occasional.
Rumex obtusifolius broad-leaved dock: common in marshland, rough grassland and on rough ground. The var. *transiens* was occasionally recorded in the marshland.
Rumex x *steinii* (*R. obtusifolius* x *R. palustris*): see Kent (1975) and Burton (1983).
Rumex palustris marsh dock : occasional in marshland, but often more abundant on dried alluvium as in 1990, and in 1919 (Salisbury 1921).
Rumex maritimus golden dock: rare, recorded on dried alluvium in 1991 and persisting, at least until 1994 when many plants were noted.

ypericum perforatum perforate St John's-wort: frequent in rough grassland and on rough ground habitats.

ypericum tetrapterum square stalked St John's-wort: rare, marshland.

ilia x *vulgaris* lime: introduced in parkland.

alva moschata musk-mallow: rare, marshland.

alva sylvestris common mallow: occasional in rough grassland and on rough ground.

iola tricolor wild pansy: see Kent (1975).

Bryonia dioica white bryony: occasional in hedgerows and scrub.

Populus alba white poplar: naturalized in woodland near the Welsh Harp Field Centre.

Populus x *canescens* grey poplar: recorded near to the Welsh Harp Field Centre.

Populus tremula aspen: present at one location in scrub north of the main arm of the Reservoir.

Populus nigra 'Italica' Lombardy poplar: introduced.

Populus x *canadensis* hybrid black poplar: introduced.

Salix pentandra bay willow: recorded by Welsh Harp Conservation Group, 1981.

Salix fragilis crack-willow: abundant in woodland in the northern, eastern and southern marshes and in adjacent woodland.

Salix alba white willow: frequent.

Salix x *sepulcralis* weeping willow: occasional in marshland, though most appear to have been planted.

Salix triandra almond willow: occasional, recorded by J. White, 1982.

Salix purpurea purple willow: see Kent (1975).

Salix daphnoides European violet willow: one introduced tree, noted by J. White, 1982.

Salix viminalis osier: common in marshland.

Salix x *calodendron* holme willow: recorded by J. White in 1982, and by earlier recorders (Kent 1975).

Salix caprea goat willow: occasional in marshland.

Salix x *reichardtii* (*S. caprea* x *S. cinerea*): noted by J. White, 1982.

Salix cinerea grey willow: frequent in marshland.

Sisymbrium loeselii false London rocket: see Kent (1975).

Sisymbrium officinale hedge mustard: frequent in rough grassland and on rough ground.

Alliaria petiolata garlic mustard: occasional in wet woodland and on rough ground habitats.

Arabidospis thaliana thale cress: see Trimen and Dyer (1869).

Bunias orientalis warty-cabbage: recorded by the Welsh Harp Conservation Group in 1981.

Barbarea vulgaris winter-cress: occasional in rough grassland and on rough ground.

Rorippa nasturtium-aquaticum water-cress: occasional in marshland.

Rorippa palustris marsh yellow-cress: occasional in marshland. Recorded on dried alluvium in 1919, 1990 and 1991.

Rorippa sylvestris creeping yellow-cress: occasional in rough grassland and on rough ground.

Rorippa amphibia great yellow-cress: occasional in marshland.

Armoracia rusticana horse-radish: occasional on rough ground habitats.

Cardamine pratensis cuckoo flower: occasional in marshland.

Cardamine flexuosa wavy bitter- cress: occasional in marshland.

Cardamine hirsuta hairy bitter-cress: frequent in marshland and rough grassland.

Aubrieta deltoidea aubretia: see Kent (1975).

Lunaria annua honesty: occasional in hedgerows and by paths, probably as a garden escape.

Capsella bursa-pastoris shepherd's-purse: frequent in rough grassland.

Lepidium draba hoary cress: occasional in rough grassland and on rough ground.

Coronopus didymus lesser swine-cress: occasional on path edges in amenity grasslands.

Diplotaxis tenuifolia perennial wall-rocket; rare, rough ground.

Brassica oleracea cabbage: recorded by Welsh Harp Conservation Group, 1981.

Brassica nigra black mustard: occasional on crushed rubble grassland.

Sinapsis arvensis charlock: occasional on rough ground.

Reseda luteola weld: occasional on rough ground.

Primula veris cowslip: on crushed rubble grassland and assumed to have been introduced, Welsh Harp Conservation Group, 1994.

Lysimachia nummularia creeping-jenny: recorded by Welsh Harp Conservation Group, 1981.

Lysimachia punctata dotted loosestrife: Burton (1983) considered that this was the correct identification for a similar species recorded at the Reservoir.

Anagallis arvensis scarlet pimpernel: rare.
Ribes nigrum blackcurrant: rare, in marshland.
Filipendula ulmaria meadowsweet: frequent in marshland.
Rubus idaeus raspberry: occasional in marshland and in scrub oak woodland.
Rubus fruticosus agg. bramble: abundant.
Rubus laciniatus cut-leaved bramble: occasional in marshland.
Potentilla anserina silverweed: occasional in marshland.
Potentilla reptans creeping cinquefoil: frequent in rough grassland and rough ground habitats.
Geum urbanum wood avens: occasional in wet woodland.
Sanguisorba officinalis great burnet: occasional in old grasslands and marshland edges, scattered along the northern side of the main arm of the Reservoir and the western side of the northern arm. These probably represent remnants of the former meadow and pasture grassland, which covered large areas on the London Clay of the Upper-Brent basin in Middlesex. Similar grassland communities are still managed for hay at Fryent Country Park, about 2 km to the west (Williams and Northcorft 1992).
Sanguisorba minor salad burnet; rare, introduced and naturalized on crushed rubble grasslands.
Aphanes probably *A. arvensis* parsley-piert: recorded by Trimen and Dyer (1869), but see Burton (1983).
Rosa arvensis field-rose: occasional.
Rosa rugosa Japanese rose: introduced.
Rosa stylosa short-styled field-rose: recorded at the Welsh Harp Field Centre.
Rosa canina dog-rose: frequent in scrub.
Prunus spinosa blackthorn: frequent and common in hedgerows and scrub.
Prunus domestica plum: occasional, probably introduced.
Prunus lusitanica Portugal laurel: rare on rough ground in marshland.
Pyrus communis pear: rare, marshland.
Malus sylvestris crab-apple: occasional in hedgerows.
Malus domestica apple: occasional in scrub.
Sorbus aucuparia rowan: occasional as a naturalized tree in hedgerows.
Sorbus torminalis wild service-tree: historical record in Kent (1975).
Crataegus monogyna hawthorn: frequent in hedgerows and scrub.
Crataegus x *macrocarpa* hybrid hawthorn: common in hedgerows, scrub and on rough ground. The hybrid is more common than either of the two parent species.
Crataegus laevigata Midland hawthorn: occasional in hedgerows.
Robinia pseudoacacia false-acacia: rare, probably introduced.
Galega officinalis goat's rue: common in rough grassland and on rough ground. This species has spread extensively at the Welsh Harp Open Space.
Lotus corniculatus common bird's-foot-trefoil: occasional in grasslands on gravel, on crushed rubble grassland and in rough grasslands.
Lotus pedunculatus greater bird's-foot-trefoil: occaional in marshland.
Ornithopus perpusillus bird's-foot: historical record in Kent (1975).
Vicia cracca tufted vetch: frequent in grassland habitats.
Vicia hirsuta hairy tare: frequent in grassland habitats.
Vicia tetrasperma smooth tare: occasional in grassland habitats.
Vicia sativa common vetch: frequent in grassland habitats.
Lathyrus pratensis meadow vetchling: frequent in grassland and marshland.
Lathyrus latifolius broad-leaved everlasting-pea: rare, on West Hendon former rubbish-tip.
Lathyrus nissolia grass vetchling: rare in rough grassland at Welsh Harp Open Space, 1991.
Ononis spinosa spiny restharrow: historical record in Kent (1975).
Melilotus altissimus tall melilot: recorded at the Welsh Harp Field Centre.
Melilotus albus white melilot: occasional on recently-disturbed ground and rough grassland.
Melilotus officinalis ribbed melilot: frequent on recently-disturbed ground and rough grassland.
Medicago lupulina black medick: frequent in rough grassland.
Medicago sativa lucerne: rare, rough grassland.
Trifolium repens white clover: common grasslands.
Trifolium hybridum alsike clover: occasional in rough ground and in dried alluvium.
Trifolium campestre hop trefoil: recorded by Welsh Harp Conservation Group, 1971.

Trifolium dubium lesser trefoil: frequent in grasslands.
Trifolium pratense red clover: frequent in grasslands.
Trifolium arvense hare's-foot clover: historical record in Kent (1975).
Lupinus x *regalis* Russell lupin: recorded by Welsh Harp Conservation Group, 1981.
Genista tinctoria dyer's greenweed: historical record in Kent (1975).
Ulex europaeus gorse: introduced.
Lythrum salicaria purple-loosestrife: occasional, marshland.
Epilobium hirsutum great willowherb: common in marshland, rough grassland and on disturbed soils.
Epilobium parviflorum hoary willowherb: occasional, southern marsh.
Epilobium montanum broad-leaved willowherb: occasional in scrub of southern marsh.
Epilobium tetragonum square-stalked willowherb: recorded by Welsh Harp Conservation Group, 1981.
Epilobium roseum pale willowherb: recorded by Welsh Harp Conservation Group, 1971.
Epilobium ciliatum American willowherb: frequent in rough grassland and marshland.
Epilobium palustre marsh willowherb: historical record in Kent (1975).
Chamerion angustifolium rosebay willowherb: common in several habitats and present in marshland.
Oenothera glazioviana large-flowered evening-primrose: rare, wasteland path
Circaea lutetiana enchanter's-nightshade: recorded by Welsh Harp Conservation Group, 1981.
Cornus sanguinea dogwood: rare, hedgerows.
Aucuba japonica spotted laurel: introduction to the area between the eastern marsh and suburban gardens.
Ilex aquifolium holly: frequent.
Buxus sempervirens box: it is assumed that this 1981 record by the Welsh Harp Conservation Group is of an introduced plant.
Mercurialis perennis dog's mercury: occasional, hedgerows.
Euphorbia lathyris caper spurge: rare, rough grassland at former rubbish-tip at West Hendon.
Euphorbia exigua dwarf spurge: historical record in Kent (1975).
Euphorbia peplus petty spurge: occasional in disturbed ground.
Euphorbia esula leafy spuge: historical record in Kent (1975).
Rhamnus cathartica buckthorn: see Kent (1975).
Frangula alnus alder buckthorn: for historical records see Kent (1975). Introduced into southern marsh during the 1980s.
Parthenocissus quinquefolia Virginia creeper: naturalized adjacent to car-park at the Welsh Harp Open Space.
Aesculus hippocastanum horse-chestnut: planted and occasionally naturalized.
Acer platanoides Norway maple: naturalized in a hedgerow.
Acer campestre field maple: occasional in hedgerows and elsewhere as a planted tree.
Acer pseudoplatanus sycamore: frequent throughout and abundant in woodland between the eastern marsh and the Edgware Road.
Geranium pratense meadow crane's-bill: recorded by Welsh Harp Conservation Group, 1981.
Geranium dissectum cut-leaved crane's-bill: frequent in grasslands.
Geranium molle dove's foot crane's-bill: rare.
Geranium robertianum herb Robert: occasional in damp woodland.
Impatiens capensis orange balsam: rare, southern marsh.
Impatiens glandulifera Indian balsam: frequent in marshland.
Hedera helix ivy: frequent.
Anthriscus sylvestris cow parsley: common in hedgerows, woodland and on rough ground.
Scandix pecten-veneris shepherd's-needle: recorded by Trimen and Dyer (1869).
Conopodium majus pignut: occasional in old grasslands on gravels.
Pimpinella saxifraga burnet-saxifrage: occasional in old grasslands and grasslands on gravels.
Aegopodium podagraria ground-elder: occasional in marshland and rough grassland.
Berula erecta lesser water-parsnip: historical record in Kent (1975).
Oenanthe crocata hemlock water-dropwort: frequent in marshland on northern and southern shores of the main arm of the Reservoir. It was not recorded at the Reservoir by Burton (1983), despite the then presence of this species along the River Thames and some of its other tributaries.
Foeniculum vulgare fennel: rare in rough ground at the former West Hendon rubbish-tip.
Conium maculatum hemlock: frequent on disturbed and rough ground.
Sison amomum stone parsley: occasional in northern marsh and on rough ground.

Angelica sylvestris wild angelica: occasional in marshland.

Heracleum sphondylium hogweed: common in marshland and rough grassland habitats.

Heracleum mantegazzianum giant hogweed: frequent. Occasional in willow woodland along the rivers. There was an extensive colony on the boundary between Chilcott Nursery and the Welsh Harp Open Space.

Vinca major greater periwinkle: introduced by Cool Oak Lane.

Solanum nigrum black nightshade: rare. Recorded near the Welsh Harp Field Centre 1986, following coppicing of oak scrub.

Solanum dulcamara bittersweet: frequent in marshland, scrub and on rough ground.

Convolvulus arvensis field bindweed: frequent in rough grassland and on rough ground.

Calystegia sepium hedge bindweed: frequent in marshland.

Calystegia silvatica large bindweed: frequent in rough grassland and on rough ground.

Menyanthes trifoliata bogbean: rare, in swamp of northern marsh. Probably introduced.

Nymphoides peltata fringed water-lily: recorded by L. Batten in the northern marsh where it was common in swamp conditions.

Lithospermum arvense field gromwell: see Kent (1975).

Symphytum x *uplandicum* Russian comfrey: occasional on rough ground.

Myosotis scorpioides water forget-me-not: occasional in the northern marsh (L. Batten).

Myosotis arvensis field forget-me-not: frequent, Welsh Harp Open Space.

Stachys officinalis betony: rare. Approximately five plants in damp herbaceous vegetation on the northern side of the eastern marsh, 1990. Recorded near to an area with several naturalized garden escapes, which suggested a possible origin for the betony.

Stachys sylvatica hedge woundwort: frequent in marshland, wet woodland, scrub and on dried alluvium.

Stachys palustris marsh woundwort: occasional in marshland and wet woodland.

Ballota nigra black horehound; frequent in rough grassland and on rough ground.

Lamium album white dead-nettle: frequent in rough grassland and on rough ground.

Lamium purpureum red dead-nettle: occasional in rough grassland.

Lamium amplexicaule henbit dead-nettle: see Trimen and Dyer (1869).

Galeopsis tetrahit common hemp-nettle: occasional in oak scrub.

Scutellaria galericulata skullcap: occasional in marshland.

Glechoma hederacea ground-ivy: occasional.

Prunella vulgaris selfheal: occasional in amenity and rough grassland.

Lycopus europaeus gipsywort: frequent in marshland.

Mentha arvensis corn mint: last recorded by Welsh Harp Conservation Group in 1981.

Mentha x *smithiana* tall mint: recorded in 1946 (Kent 1975).

Mentha x *gracilis* bushy mint: last recorded by Welsh Harp Conservation Group, 1971.

Mentha aquatica water mint: frequent in marshland.

Mentha spicata spear mint: occasional on rough ground. This species is assumed to include erroneous records of horse mint.

Callitriche stagnalis common water-starwort: recorded by Salisbury (1921) on exposed alluvium.

Callitriche hamulata intermediate water-starwort: rare, in a pond on the northern shore of the Reservoir.

Plantago major greater plantain: common.

Plantago lanceolata ribwort plantain: common.

Buddleja davidii butterfly-bush: frequent on rough ground.

Fraxinus excelsior ash: frequent in hedgerows and scrub.

Syringa vulgaris lilac: see Kent (1975).

Ligustrum ovalifolium garden privet: frequent in scrub and on rough ground in the vicinity of allotments and a former rubbish-tip. Previous records of wild privet probably refer to this species.

Verbascum thapsus great mullein: occasional on rough ground.

Scrophularia nodosa common figwort: occasional in marshland.

Scrophularia auriculata water figwort: occasional in southern marsh.

Antirrhinum majus snapdragon: rare, on rough ground.

Linaria vulgaris common toadflax: occasional on rough ground.

Digitalis purpurea foxglove: occasional.

Veronica chamaedrys germander speedwell: recorded by Welsh Harp Conservation Group, 1981.

Veronica beccabunga brooklime: recorded on exposed alluvium in 1919 (Salisbury 1921).

Veronica persica common field-speedwell: occasional in amenity grassland.

Campanula trachelium nettle-leaved bellflower: rare, on rough ground and probably a garden escape.

Campanula rapunculoides creeping bellflower: last recorded by Welsh Harp Conservation Group in 1971.

Sherardia arvensis field madder: last recorded in 1945 (Kent 1975).

Galium verum lady's bedstraw: occasional. Recorded in 1991 on gravels at West Hendon; and in rough grassland on crushed concrete.

Galium mollugo hedge bedstraw: there were several records between 1869 and 1948.

Galium aparine cleavers: common.

Sambucus nigra elder: frequent.

Viburnum opulus guelder-rose: occasional and probably introduced.

Leycesteria formosa Himalayan honeysuckle: rare on rough ground at West Hendon.

Lonicera periclymenum honeysuckle: occasional in scrub.

Dispsacus fullonum wild teasel : frequent on rough ground.

Knautia arvensis field scabious: see Kent (1975).

Succisa pratensis devil's-bit scabious: rare. Last recorded in 1985 on old grassland north of the main arm of the Reservoir.

Arctium minus lesser burdock: frequent on rough ground.

Carduus crispus welted thistle: recorded at the Welsh Harp Field Centre in 1980, and listed in Kent (1975).

Cirsium vulgare spear thistle: frequent on rough ground.

Cirsium palustre marsh thistle: occasional in marshland.

Cirsium arvense creeping thistle: common.

Centaurea scabiosa greater knapweed: rare on crushed rubble grassland and probably introduced.

Centaurea nigra black knapweed: occasional in old grasslands on gravels, in oak scrub which had developed on old grasslands, on rough ground, and as a probable introduction on crushed rubble grasslands.

Lapsana communis nipplewort: frequent on rough ground.

Hypochaeris radicata cat's-ear: frequent in grassland.

Leontodon autumnalis autumn hawkbit: frequent in grassland.

Leontodon saxatilis lesser hawkbit: see Kent (1975).

Picris echioides bristly oxtongue: frequent in rough grassland and on rough ground.

Picris hieracioides hawkweed oxtongue: rare, on crushed rubble grassland and probably introduced.

Tragopogon pratensis goat's-beard: frequent in rough grassland and on rough ground.

Sonchus arvensis perennial sow-thistle: occasional in marshland, on rough ground and on crushed rubble grassland.

Sonchus oleraceus smooth sow-thistle: frequent.

Sonchus asper prickly sow-thistle: frequent.

Lactuca serriola prickly lettuce: frequent.

Taraxacum officinale agg. dandelions: frequent.

Crepis capillaris smooth hawk's-beard: occasional in rough grassland and on rough ground.

Crepis vesicaria beaked hawk's-beard: occasional on rough ground.

Hieracium sabaudum hawkweed: occasional in grasslands on gravels, on the north and south sides of the main arm of the Reservoir.

Gnaphalium uliginosum marsh cudweed: occasional in marshland and on damp paths.

Pulicaria dysenterica common fleabane: occasional in eastern marsh, probably as a garden escape.

Solidago canadensis Canadian golden rod: frequent, occurring in marshland, rough grassland and on rough ground.

Solidago gigantea early golden rod: recorded by the Welsh Harp Conservation Group in 1971 and 1981.

Aster x *salignus* common Michaelmas daisy: frequent in marshland and on rough ground. All Michaelmas daisies have been included under this name, though records to date have referred to *Aster novi-belgii* confused Michaelmas daisy.

Conyza canadensis Canadian fleabane: occasional.

Bellis perennis daisy: frequent, especially in amenity grassland.

Tanacetum parthenium feverfew: occasional, in southern marsh.

Tanacetum vulgare tansy: recorded by Kent (1975).

Artemisia vulgaris mugwort: frequent on rough ground and recorded in marshland.

Artemisia verlotiorum Chinese mugwort: recorded by Welsh Harp Conservation Group in 1971.

Achillea ptarmica sneezewort: rare, on old grassland to the east of the parish boundary, on the northern side of the main arm of the Reservoir.
Achillea millefolium yarrow: common in grasslands and on rough ground.
Anthemis cotula stinking chamomile: recorded by Welsh Harp Conservation Group in 1971.
Leucanthemum vulgare oxeye daisy: occasional on rough ground and as a naturalized introduction on crushed rubble grassland.
Leucanthemum x *superbum* Shasta daisy: occasional on rough ground.
Matricaria recutita scented mayweed: occasional on rough ground.
Matricaria discoidea pineapple-weed: frequent on footpaths and rough ground.
Tripleurospermum inodorum scentless mayweed: frequent on rough ground.
Senecio jacobaea common ragwort: frequent in rough grassland, on rough ground and recorded in marshland.
Senecio aquaticus marsh ragwort: rare in southern/eastern marsh.
Senecio erucifolius hoary ragwort: frequent in rough grassland, on rough ground and in southern marsh.
Senecio squalidus Oxford ragwort: occasional in rough grassland, marshland and wet woodland.
Senecio vularis groundsel: occasional on rough ground and in amenity grassland.
Senecio sylvaticus heath groundsel: occasional in oak scrub and old grassland on gravels.
Tussilago farfara colt's-foot: frequent in marshland and on rough ground.
Calendula officinalis pot marigold: recorded by Welsh Harp Conservation Group, 1981.
Helianthus x *laetiflorus* perennial sunflower: recorded by Welsh Harp Conservation Group, 1981.
Bidens cernua nodding bur-marigold: rare. Previous records include that of Salisbury (1921) who noted it on exposed alluvium in 1919.
Bidens tripartita trifid bur-marigold: occasional in marshland. Noted on exposed alluvium in 1919 (Salisbury 1921), and in 1990.
Bidens connata London bur-marigold: rare in northern marsh.
Eupatorium cannabinum hemp-agrimony: noted by Kent (1975).
Butomus umbellatus flowering rush: occasional in marshland. Kent (1975) noted it as locally abundant in 1972, and L. Batten also considered it abundant form 1975–9, following drainage of the Reservoir in the summer of 1974. Recorded annually from 1983–6, but less so since then.
Sagittaria sp. arrowhead: rare in marshland. Possibly a species other than *S. sagittifolia*.
Baldellia ranunculoides lesser water-plantain: recorded in 1917 (see Kent (1975)), and in 1971 by the Welsh Harp Conservation Group.
Alisma plantago-aquatica water-plantain: frequent on exposed alluvium and in marshland.
Elodea canadensis Canadian waterweed: recorded by Welsh Harp Conservation Group in 1981.
Elodea nuttallii Nuttall's waterweed: recorded in the Brent Reservoir by M. J. Andrews in 1976 (Burton 1977) and now more frequent than *E. canadensis* in local ponds.
Potamogeton crispus curled pondweed: occasional, but apparently confined to a pond near to the northern shore.
Arum maculatum lords-and-ladies: frequent in hedgerows, scrub and in shoreline vegetation.
Arum italicum Italian lords-and-ladies: occasional. A single plant was recorded by W. G. Teagle at the edge of the Reservoir in 1986 (Burton 1987), but now naturalized in scrub adjacent to the car-park at the Welsh Harp Open Space.
Lemna minor common duckweed; frequent in suitable conditions in swamp and in discarded plastic containers in marshland.
Lemna trisulca ivy-leaved duckweed: recorded by Welsh Harp Conservation Group in 1981.
Juncus bufonius toad rush: occasional in marshland and on damp gravel soils.
Juncus articulatus jointed rush: occasional in marshland.
Juncus inflexus hard rush: frequent in marshland.
Juncus effusus soft rush: common in marshland.
Juncus conglomeratus compact rush: frequent in marshland.
Luzula campestris field wood-rush: occasional in old grassland on gravels at West Hendon.
Eleocharis palustris common spike-rush: rare in marshland on northern shore of the main arm of he Reservoir in 1988.
Bolboschoenus maritimus sea club-rush: common in shallow water on the shoreline around the Reservoir, particularly where the marshland was not shaded. Appears to have spread since Kent (1975) noted it at the eastern end of the Reservoir.
Schoenoplectus lacustris common club-rush: rare, in shallow water on the northern shore.

Carex otrubae false fox-sedge: frequent in marshland.

Carex remota remote sedge: frequent in wet woodland and marshland.

Carex hirta hairy sedge: frequent in marshland and in grasslands on gravels.

Carex acutiformis lesser pond-sedge: unconfirmed. The presence and distribution of the species, as separate from that of *C. acuta*, could not be confirmed. *C. acutiformis* is listed as present on the 'Reasons for Notification' of the Site of Special Scientific Interest (Nature Conservancy Council *c.*1986). During the current survey it was apparently recorded in 1984. However, it was not identified in 1994 and similar material collected in August 1994 keyed out as *C. acuta*.

Carex pseudocyperus cyperus sedge: frequent, particularly in the northern marsh.

Carex pendula pendulous sedge: frequent in marshland, in wet woodland and also on rough ground.

Carex sylvatica wood-sedge: rare, on an embankment to the east of the Silk Stream at the boundary of woodland and rough ground.

Carex acuta slender tufted-sedge: rare and apparently confined to one colony in the southern marsh. First recorded in August 1994, this record should be noted in conjunction with the notes for *C. acutiformis.*

Festuca gigantea giant fescue: occasional in wet woodland, marshland and on rough ground.

Festuca rubra red fescue: frequent in grasslands on gravels, on crushed rubble, on anthills and on rough ground.

Lolium perenne perennial rye-grass: common in grasslands.

Vulpia bromoides squirreltail fescue: rare, with records from an anthill and on rough ground.

Cynosurus cristatus crested dog's-tail: frequent in grassland.

Briza media quaking-grass: rare on crushed rubble grassland. Now naturalized, but assumed to have been introduced, possibly as part of a wild flower seed mixture.

Poa annua annual meadow-grass: common.

Poa trivialis rough meadow-grass: common.

Poa pratensis smooth meadow-grass: common.

Dactylis glomerata cock's-foot: common.

Glyceria maxima reed sweet-grass: rare in swamp of the northern marsh.

Glyceria fluitans floating sweet-grass: recorded in 1919 on exposed alluvium (Salisbury 1921).

Arrhenatherum elatius false oat-grass: common.

Avena fatua wild-oat: rare, roadside.

Trisetum flavescens yellow oat-grass: occasional in grassland.

Deschampsia cespitosa tufted hair-grass: common in rough grassland and marshland.

Holcus lanatus Yorkshire fog: common.

Holcus mollis creeping soft-grass: occasional in oak scrub and gravel grasslands.

Anthoxanthum odoratum sweet vernal-grass: occasional in old grasslands to the north of the Reservoir.

Phalaris arundinacea reed canary-grass: abundant in marshland and occasional on rough ground.

Phalaris canariensis canary-grass: rare. Recorded by Welsh Harp Conservation Group in 1971.

Agrostis capillaris common bent: common, particularly in grasslands on gravels.

Agrostis stolonifera creeping bent: common.

Calamagrostis epigejos wood small-reed: apparently recorded by Welsh Harp Conservation Group in 1971.

Alopecurus pratensis meadow foxtail: frequent.

Alopecurus geniculatus marsh foxtail: frequent.

Alopecurus aequalis orange foxtail: recorded by J. E. Lousley in 1949, Welsh Harp Conservation Group in 1971 and noted by Kent (1975).

Phleum pratense Timothy: occasional.

Phleum bertolonii smaller cat's-tail: frequent in grasslands.

Bromus racemosus smooth brome: recorded by Trimen and Dyer (1869).

Bromus hordeaceus soft-brome: occasional.

Bromus x *pseudothominii* lesser soft-brome: see Kent (1975).

Bromopsis ramosa hairy brome: frequent in hedgerows and also recorded in wet woodland of the northern marsh.

Anisantha sterilis barren brome: frequent.

Brachypodium sylvaticum false brome: included in the list compiled by Ward and Pilcher (1989).

Elytrigia repens couch: common.

Hordeum murinum wall barley: frequent on rough ground.

Hordeum secalinum meadow barley: occasional in rough grassland.

Triticum aestivum bread-wheat: rare on disturbed ground.

Phragmites australis common reed: abundant in the eastern marsh in a reed-bed south of the River Brent, and also occurring in the northern and southern marshes. See Frontispiece.

Sparganium erectum branched bur-reed: occasional, in marshland.

Typha latifolia bulrush: common in marshland.

Typha x *glauca* (*T. latifolia* x *T. angustifolia*): recorded by Dr A. C. Leslie in 1983 (Burton 1984).

Typha angustifolia lesser bulrush: frequent in northern marsh.

Ornithogalum angustifolium Star-of-Bethlehem: recorded in the grounds of the Welsh Harp Field Centre in 1980.

Hyacinthoides non-scripta bluebell: frequent.

Hyacinthoides non-scripta x *H. hispanica*: frequent on rough ground and in secondary woodland.

Hyacinthoides hispanica Spanish bluebell: occasional, as in the parish boundary hedgerow where the three bluebell species were noted.

Muscari armeniacum garden grape-hyacinth: occasional on rough ground where introduced with waste material.

Allium ursinum ramsons: rare in eastern wet woodland in eastern marsh.

Allium vineale wild onion: occasional on rough ground.

Galanthus nivalis snowdrop: occasional, probably as garden escapes and of planted origin.

Narcissus daffodils: occasional as garden escapes on rough ground and also recorded in marshland amongst yellow iris. The specific identifications are not known.

Asparagus officinalis garden asparagus: rare on rough ground.

Sisyrinchium montanum American blue-eyed-grass: see Kent (1975).

Iris pseudacorus yellow iris: common in marshland.

Iris versicolor purple iris: recorded in 1971 by Welsh Harp Conservation Group.

Tamus communis black bryony: recorded in scrub at the Welsh Harp Field Centre in 1980.

Epipactis helleborine broad-leaved helleborine: occasional in scrub and wet woodland in the eastern and southern marshes.

Anacamptis pyramidalis pyramidal orchid: rare and probably locally extinct, it was however, recorded annually from 1985 to 1988. The single plant was recorded in the eastern marsh, approximately three metres from the water's edge and in a location prone to flooding. The surrounding low herbaceous vegetation was partially shaded by adjacent trees.

Dactylorhiza fuchsii common spotted-orchid: occasional on the boundary of the southern marsh and gravel grasslands. The colony was damaged in 1987 during excavations to drain a football pitch and subsequent competition from Michaelmas daisies. L. Batten has noted small colonies on the northern side of the Reservoir.

Dactylorhiza praetermissa southern marsh-orchid: rare in marshland on the northern side of the main arm of the Reservoir. Two plants were noted in 1988 and three in 1991.

Ophrys apifera bee orchid: rare on rough ground and first recorded by W. Griffin in 1991. Two plants were noted in 1994.

Discussion

Plant communities

The species records suggested that whilst the open water had few plant species, the marshland, which extended along approximately 4,500 metres of shoreline, was an important habitat. On the Reservoir side of the marsh there were a few areas of swamp vegetation. The more common marshland species included *Dryopteris filix-mas* male-fern, *Alnus glutinosa* alder, *Persicaria amphibia* amphibious bistort, *Persicaria maculosa* redshank, *Persicaria hydropiper* water-pepper, *Salix fragilis* crack-willow, *Salix alba* white willow, *Salix viminalis* osier, *Salix cinerea* grey willow, *Filipendula ulmaria* meadowsweet, *Epilobium hirsutum* great willowherb, *Impatiens glandulifera* Indian balsam, *Heracleum sphondylium* hogweed, *Lycopus europaeus* gipsywort, *Mentha aquatica* water mint, *Solidago canadensis* Canadian golden rod, *Senecio erucifolius* hoary ragwort, *Alisma plantago-aquatica* water plantain, *Juncus inflexus* hard rush, *Juncus effusus* soft rush, *Juncus conglomeratus* compact rush, *Bolboschoenus maritimus* sea club-rush, *Carex otrubae* false fox-sedge, *Carex remota* remote sedge, *Carex hirta* hairy sedge, *Carex pseudocyperus* Cyperus sedge, *Carex pendula* pendulous sedge, *Deschampsia cespitosa* tufted hair-grass, *Phalaris arundinacea* reed canary-grass, *Phragmites australis* common reed, *Typha latifolia* bulrush, *Typha angustifolia* lesser bulrush and *Iris pseudacorus* yellow iris.

On the landward side of the marshland, some of the wetland species extended into wet willow and other damp woodland. These species included *Dryopteris filix-mas* male-fern, *Dryopteris dilatata* broad buckler fern, *Ranunculus ficaria* lesser celandine, *Alliaria petiolata* garlic mustard, *Geum urbanum* wood avens, *Geranium robertianum* herb Robert, *Carex remota* remote sedge, *Carex pendula* pendulous sedge, *Festuca gigantea* giant fescue, *Bromopsis ramosa* hairy brome and *Epipactis helleborine* broad-leaved helleborine.

Bunds, excavated for the pounding and draining of alluvium dredged from the Reservoir had been created at West Hendon open space and on land adjacent to Staples Corner. Initially these supported a flora of the seed bank from the drained alluvium including *Ranunculus sceleratus* celery-leaved buttercup, *Chenopodium rubrum* red goosefoot, *Chenopodium polyspermum* many-seeded goosefoot, *Persicaria maculosa* redshank, *Rumex palustris* marsh dock, *Rumex maritimus* golden dock, *Rorippa palustris* marsh yellow-cress, *Bidens tripartita* trifid bur-marigold and *Alisma plantago-aquatica* water-plantain. After the first year this flora was gradually superseded by one more characteristic of the adjacent rough ground areas.

There was a narrow belt of acid grassland on the Taplow Gravels, which occurred intermittently along the northern and southern shores of the main arm of the Reservoir. A small area of other gravels occurred on higher ground in the West Hendon open space. Typical species included *Rumex acetosella* sheep's sorrel, *Rumex acetosa* common sorrel, *Lotus corniculatus* common bird's-foot-trefoil, *Conopodium majus* pignut, *Pimpinella saxifraga* burnet-saxifrage, *Galium verum* lady's bedstraw, *Centaurea nigra* black knapweed, *Hieracium sabaudum* hawkweed, *Senecio sylvaticus* heath groundsel, *Luzula campestris* field wood-rush, *Carex hirta* hairy sedge, *Festuca rubra* red fescue, *Holcus lanatus* Yorkshire fog, *Holcus mollis* creeping soft-grass, *Anthoxanthum odoratum* sweet vernal-grass and *Agrostis capillaris* common bent.

At the eastern end of Neasden Recreation Ground the grassland was on a crushed-rubble substrate and appeared to have been of an introduced calcareous grassland seed mixture. Species included *Stellaria graminea* lesser stitchwort, *Brassica nigra* black mustard, *Sanguisorba minor* salad burnet, *Lotus corniculatus* common bird's-foot-trefoil, *Galium verum* lady's bedstraw, *Centaurea scabiosa* greater knapweed, *Centaurea nigra* black knapweed, *Picris hieracioides* hawkweed oxtongue, *Leucanthemum vulgare* oxeye daisy, *Festuca rubra* red fescue and *Briza media* quaking-grass.

There were a variety of other habitats in the open spaces adjacent to the Reservoir. Of these, only the hedgerows predated the creation of the Reservoir. There were approximately 4,200 metres of former agricultural hedgerows in the vicinity of the Brent Reservoir, particularly on the open spaces to the north of the Reservoir and in Silver Jubilee Park. (see Williams (1989) for a list of and brief description of each hedgerow.) There were approximately 130 standard (timber-sized) trees in the hedgerows, of which 117 were of pedunculate oak *Quercus robur.*

A double hedgerow and former green lane represented an earlier part of Wood Lane, and also the parish boundary between Hendon to the east and Kingsbury to the west, and now the Borough boundary between Barnet and Brent. The lane once extended southwards to a crossing point of the River Brent. Part of this route was flooded when the Reservoir was created, though a wooden fence and/ or tree remains were still visible when the water level was lowered in 1984 and 1995.

The other habitats included rough and waste ground, much of it occurring on former rubbish-tips. The most obvious former rubbish-tip was to the west of the northern arm of the Reservoir. A second, at the Welsh Harp Open Space, had been capped with clay and on which rough grassland had developed. Elsewhere, scrub and secondary woodland had developed on some of the rough ground areas. Other grasslands included amenity and sports pitch grasslands, rough grassland and others which had developed on made-ground gravels.

Habitats

Three aspects of the habitats at the Brent Reservoir were noted from the results of the survey. Firstly, the marshland and associated wetlands around the perimeter of the Reservoir were an important habitat. Secondly, there were a variety of urban habitats in the open spaces adjacent to the Reservoir. Thirdly, both the marshland and the other habitats appeared to be changing rapidly, due to changes in land use and land management. Many of the plant species which had been recorded in the area were often casuals and introductions, though many had become established.

Observations suggest that the marshland and its vegetation has changed considerably during recent decades, and that this process is continuing. For example, *Bolboschoenus maritimus* sea-club-rush has spread around much of the Reservoir on the open water (swamp side of the marshland. *Phragmites australis* common reed has formed a large reed-bed in the eastern marsh, and *Oenanthe crocata* hemlock water-dropwort occurs frequently as single plants and in larger colonies.

The marshland itself requires permanently wet and relatively unshaded conditions Conservation of this habitat will depend upon management of trees, especially species of willow, which can shade the marshland flora and are also a problem in the reed-beds Brian, Price, Redwood and Wheeler (1987) found that unshaded ponds in Cheshire had more plant species than shaded ponds. The management of trees at the water's edge, even if by coppicing, has proved controversial to some people, who prefer the view of the trees to conservation of the marshland habitats. However, it should be noted that wet woodland of which there is a large area in the southern marsh, is an additional habitat. Mountford (1994) found that the drainage and felling of woodland in English grazing marshes resulted in a loss of plant species.

Large areas of alluvium may be exposed during times of drought, as in 1919 (Salisbury 1921), when the Reservoir was drained as in 1984, and in bunds constructed to take material dredged from the Reservoir, as adjacent to Staples Corner in 1989 and at West Hendon in 1990. The vegetation which developed in the drained alluvium included species which appeared to be characteristic of such circumstances and some which were not usually noted in marshland.

The gravel grasslands are susceptible to any change in land-use, of which the main change at present appears to be from an increase in scrub, often of oak. In the absence of grazing or mowing, these grasslands appear to benefit from considerable trampling from visitors.

The use of crushed rubble, often including a large quantity of crushed concrete, is a well-known technique for creating grassland habitats which mimic chalk downland. Such creations are usually well drained, of low nutrient content and with a relatively high pH providing a suitable substrate for seed mixtures using calcareous wildflowers (Luscombe and Scott 1994). The specification of the mixture used on the crushed rubble at the eastern end of Neasden Recreation Ground is not known, but some of the naturalized species in the grassland are not usually found in the Brent area.

Acknowledgements

The survey has involved the support of many people over several years. In particular we wish to thank Dr Leo Batten, Roy Beddard and Mike Andre of the Welsh Harp Conservation Group, William Griffin of the London Borough of Barnet's Ranger Service, E. Holmquist and Chris Harris of the Welsh Harp Field Centre, and several past and present officers of Brent Council including Geoffrey Hewlett, Peter Creasey, Neil Hempstead, Mike Manuel, Shaun Faulkner and Elvis Johnson-Idan. Rodney M. Burton of the London Natural History Society identified several specimens.

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Book review

The Badger Man: memoirs of a biologist. Ernest Neal. Providence Press, Haddenham. 1994. 274 p. ISBN 0 903803 28 3.

The subtitle of this book accurately reflects the contents, for this is very much about the life of the man and not the badgers. Of course, badgers (and other mammals) do get mentioned fairly frequently after his first encounter with the species at the age of twenty-five in 1936.

The book relates the author's life history from his childhood in Hertfordshire and London, and boarding school through to the Second World War and his retirement following years spent teaching.

Key points throughout this long period, when natural history was undergoing great changes and advances, are documented, including the launch of The Mammal Society in the 1950s and his local county naturalists' trust.

In all parts of his writing it is apparent that his Christian upbringing (his father was a Baptist minister) plays a crucial role in his life. This is neatly summarized in the final chapter when he discusses his religious beliefs in more detail and combines these with his scientific training into an overall philosophy for life.

As an autobiography it is a pleasant read throughout. If I had a personal preference it would have been for more natural history anecdotes to be included from his early life. This comment should not, however, detract from an interesting book.

CLIVE HERBERT

Impacts of trampling and dog fouling on vegetation and soil conditions on Headley Heath

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Abstract

Vegetation cover, dog faecal deposition and soil conditions were measured along transects running across a major footpath on Headley Heath, Survey. There was a gradient in the floral community, with grasses (principally *Deschampsia flexuosa*) dominating adjacent to the path and heather *Calluna vulgaris* further away. Soil compaction and dog fouling declined with distance from path. There were significant differences between transects, with one location on a major path nearest to the main car-park showing greatest impact in terms of dog fouling and soil compaction. Soil phosphate followed the same distribution pattern as canine faeces, as (to a lesser extent) did ammonium nitrogen. Fouling was associated with a shift in the vegetation away from *C. vulgaris* towards *D. flexuosa*. It is concluded that soil eutrophication caused by canine wastes was a factor affecting the heathland flora.

Introduction

Lowland heath is among the most endangered habitats in the UK (Tubbs 1991). It is essentially an artificial habitat, resulting from prolonged human interference, and is characterized by an acidic soil deficient in many nutrients, notably nitrogen and phosphorus (Gimingham 1975).

Heaths face a number of pressures which manifest themselves as floral changes. Development, catastrophic fires, and natural succession to pine/birch forest have removed the conservation value of many areas of heathland (Nature Conservancy Council 1984). In some areas high levels of nitrogen deposition from atmospheric pollution are leading to heathland plants such as common heather *Calluna vulgaris* being replaced by grasses such as wavy hair grass *Deschampsia flexuosa* (van Breemen and van Dijk 1988). Although ammonia pollution is not as high in the UK as in the Netherlands (UKRGAR 1990), similar effects may be caused by other sources of soil eutrophication. One input of fertility that has received little attention as a conservation management problem is the deposition of canine faeces. In areas where extensive dog walking is allowed, the input of nitrogen, phosphate and potassium from canine faeces and urine clearly has potential to exert a significant fertilizing effect.

At the study site, Headley Heath, a recent study suggested that 70 per cent of footpath usage was by dog walkers, with the main path from the largest car-park carrying approximately 600 dogs per day (Anon 1991). This usage must be expected to increase the nutrient inputs to the site, in addition to the effects of trampling on pathside vegetation. The study below sought to investigate the effects of this usage on the soil and vegetation around a busy heath path.

Methods

Site description

Headley Heath is an SSSI lowland heath near the towns of Dorking and Leatherhead (grid reference TQ200535). It is known to have been used for sheep grazing and firewood collection until the 1880s. Heathland vegetation persisted until it was used for heavy tracked vehicle training during the Second World War. The resulting soil disturbance led to extensive encroachment by silver birch *Betula pendula*. Today the site contains areas of *Calluna*-dominated heath mixed with oak and birch woodland. Away from the study site, a chalk outcrop creates unusual mixtures of calcicoles and calcifuges.

The study was conducted during August 1993, on a path leading south away from the main car-park, starting at 100 m from the car-park. The dominant vegetation here was heather *Calluna vulgaris* and wavy hair grass *Deschampsia flexuosa,* along with bracken *Pteridium aquilinum* and purple moor grass *Molinia caerulea.* Pits dug here showed the soil to be a podsol (the classic heathland soil), with a pH (distilled water) between 3.5 and 4. Four transects were taken across the path at 50 m intervals. Each transect ran from 5 m left of the path to 5 m to the right, with samples taken at 0.5, 1.0, 2.0, 3.5 and 5.5 m each side. Thus a total of 4x5x2 = 40 samples were taken.

Measurements

For each sample the following data were collected: soil compaction (using an ELE penetrometer model EL28-670), percentage cover of each plant species in a 1 m square quadrat, and percentage cover of dog faeces. Two replicate samples of soil (0–10 cm) were taken for chemical analysis. The pH was measured for a 10 g : 25 ml mix of soil and distilled water on a Gallenkamp pH stick PHK 120B. Soil was air dried, sieved (60-mesh sieve), and extracted with 2.5 per cent acetic acid for K and P analysis. Potassium was analysed by atomic absorbtion spectroscopy calibrated against solutions of potassium chloride. Phosphorus was determined by colorimetry using the molybdate blue method (Allen 1990). Nitrate nitrogen was determined for distilled water extracts by ion selective electrode. Ammonium nitrogen was determined on deionized water extracts by addition of NaOH to liberate NH_3, followed by measurement on an ammonia probe.

Statistical methods

Chemical data and soil compaction were analysed for effects of transect and of distance from path by 2-way analysis of variance (ANOVA). The non-parametric Kruskal–Wallis test was used for all other data, testing separately effects of distance from path or of transect number. Relationships between variables were examined by Spearman's correlation coefficients. Vegetation data were ordinated by principal components analysis of untransformed data (Gauch 1982). All calculations were performed using the statistical package SPSS for Windows.

Results

Dog faecal deposition and vegetation data are summarized in Table 1 along with the significance of effects of distance from path and of transect number. Faecal deposition peaked in transect number 2 and at 1 m distance from the path (Figure 1). *D. flexuosa* declined away from the path while heather increased (Figure 1). Vegetation data were simplified by principal components analysis to identify underlying environmental patterns: the resulting ordination is given in Table 2. The first axis of the ordination accounts for 32 per cent of the variance, and reflects the gradient from *D. flexuosa*-dominated communities to *C. vulgaris*. To a first approximation the first axis score is an indication of the health of the heathland flora, with high scores indicating a healthy heather-dominated system and negative scores an area undergoing invasion by grasses. The first principal axis scores varied significantly with distance from path ($F_{4,35}$ = 5.5, $p<0.01$) and between transects ($F_{3,36}$ = 6.6, $p<0.01$), with negative scores for transect 2 and for positions adjacent to the path. The second principal axis reflected a gradient from *Molinia caerulea* to *Ulex europaeus,* but was unrelated to the compaction/eutrophication effect detected on the first axis.

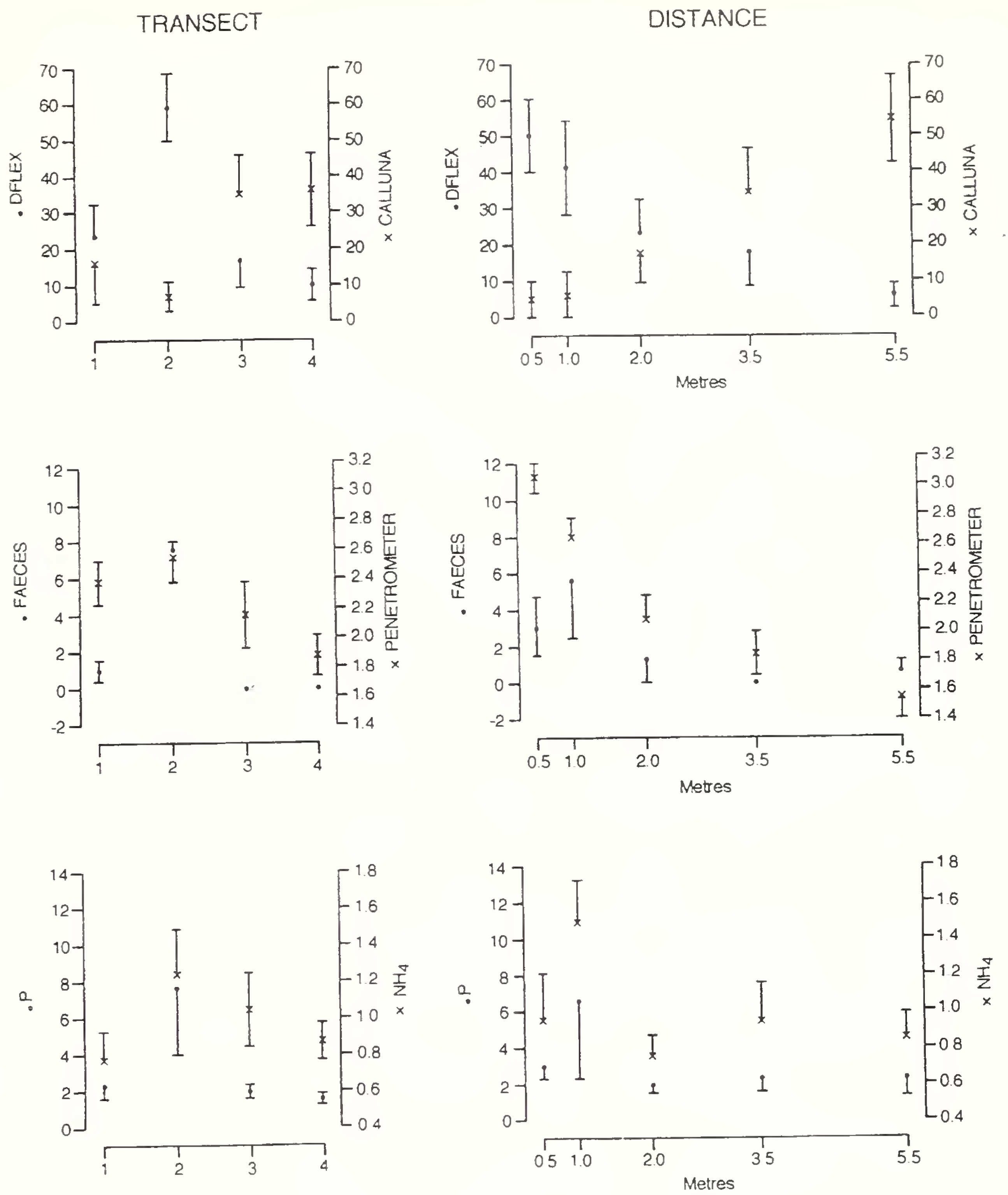

FIGURE 1. Summary results for Headley Heath transects, showing how *Deschampsia flexuosa*, *Calluna vulgaris*, faecal deposition, soil compaction, soil phosphate and ammonium varied between transects and with distance from path. Abbreviations: CALLUNA–*Calluna vulgaris*, DFLEX–*Deschampsia flexuosa*, DISTANCE–distance from path (m), FAECES–% cover canine faeces, NH–soil ammonium (ppm), P–soil phosphate (ppm), PENETROMETER–soil compaction (Kg cm^{-2}), TRANSECT–transect number. Error bars represent 1 s.e.

TABLE 1. Summary data for dog faecal deposition and plant cover along Headley Heath transects. All data refer to percentage cover estimates.

Cover of	**Mean± s.e.**	**Significance of**	
		distance	**transect**
Calluna vulgaris	23.5 ±4.9	**	NS
Deschampsia flexuosa	27.4±4.8	*	**
Molinia caerulea	10.8±2.7	NS	NS
Pteridium aquilinum	4.8±2.6	NS	NS
Ulex europaeus	10.8±3.8	NS	NS
Canine faeces	2.1±0.8	NS	**

Abbreviations: distance—distance from path, NS—$p>0.05$, *—$p<0.05$, **—$p<0.01$

TABLE 2. A summary of the principal components analysis of the Headley Heath vegetation data.

Axis	**1**	**2**
Percentage variance	32	25
Eigenvector scores for		
Calluna vulgaris	0.80	0.15
Deschampsia flexuosa	-0.89	-0.19
Molinia caerulea	-0.02	0.77
Pteridium aquilinum	-0.02	0.25
Ulex europaeus	0.37	-0.73

Mean first axis for each transect

Transect	1	2	3	4
Score	0.05	-0.97	0.34	0.58

Mean first axis scores for each distance from path

Distance (m)	0.5	1	2	3.5	5.5
Score	-0.77	-0.60	0.10	0.39	0.88

Data on soil chemistry and compaction are summarized in Table 3, along with the significance of transect and position effects. Soil compaction decreased significantly with distance from path (Figure 1), and was highest in transect number 2.

TABLE 3. Summary physical data for Headley Heath soil samples. All data mg100 g^{-1} except compaction (Kg cm^{-2}), water content (%) and pH.

Parameter	**Mean value± s. e.**	**F value for effect of**		
		dist.	tran.	d.*t.
Compaction	2.24± 0.11	**	*	NS
pH	3.79± 0.04	NS	*	NS
K	2.38± 0.27	NS	NS	NS
NH_4	0.99± 0.09	NS	NS	NS
NO_3	2.98± 0.08	NS	NS	NS
P	3.16± 0.85	**	**	**
Water %	11.47± 1.12	NS	NS	NS

Abbreviations: dist.—distance from path, tran.—transect number, d. *t.—interaction term, NS—p>0.05, *p<0.05, **—p<0.01

The interrelationship of the variables was examined by construction of a matrix of Spearman's correlation coefficients (Table 4). Soil phosphate, compaction, and cover of *D. flexuosa* were positively correlated with faecal deposition, while heather was negatively correlated with faecal deposition, compaction, and also with pH (i.e. it was associated with the most-acid soils).

TABLE 4. Spearman's matrix for soil and plant variables along Headley Heath transects. Only significant ($p<0.05$) results are shown.

Dog	1										
Df	+**	1									
Cv	-*	-**	1								
Mc				1							
Ue				-*	1						
pH		+*	-**			1					
K				+*	-*	+*	1				
P	+**	+*	-*		-**		+**	1			
NH_4									1		
NO_3									+**	1	
Comp.	+**	+**	-**			+**		+**			1
	Dog	Df	Cv	Mc	Ue	pH	K	P	NH_4	NO_3	Comp.

Abbreviations:
Dog: % cover canine faeces, Df – % cover *Deschampsia flexuosa*, Cv – % cover *Calluna vulgaris*, Mc – % cover *Molinia caerulea*, Ue – % cover *Ulex europaeus*, pH – soil pH, K – soil extractable potassium, mg100 g^{-1}, P – soil extractable phosphorus, mg100 g^{-1}, NH_4 – soil extractable ammonium, mg100 g^{-1}, NO_3 – soil extractable nitrate, mg100 g^{-1}, comp. – soil compaction (Kg cm^{-2}),
+* – significant ($p<0.05$) positive association, +** – significant ($p<0.01$) positive association,
-* – significant ($p<0.05$) negative association, +* – significant ($p<0.01$) negative association.

Discussion

The results above show several environmental gradients to have been detected away from busy heathland paths. Floral composition changed from grasses near the path to a heather-dominated community further away. Soil composition was highest near the path. The compaction is clearly due to the influence of trampling (both human and possibly canine). Faecal deposition, soil phosphate and ammonium all peaked at 1 m from the path, clearly showing soil eutrophication.

Principal components analysis showed that the largest source of variation in the floral data was the gradient from a grass-dominated system to pure heather. The first principal axis score increased with increasing from the path, reflecting heath damage adjacent to the paths.

Precisely the same pattern can be discerned when comparing results between transects. Transect number 2 (on a major path closest to the car-park) had the highest faecal deposition, soil phosphate, ammonium nitrogen, and cover of *D. flexuosa*, along with lowest levels of heather (Figure 1) and first principal axis score (Table 2). This area of heath clearly suffered eutrophication and damage from dog walkers.

Streeter (1971) studied the influence of trampling at Box Hill on chalk grassland flora, and found a tendency for grasses (*Lolium perenne* and *Cynosurus cristatus*) to increase in the most trampled regions while *Thymus drucei* and *Asperula cynanchica* decreased. Soil compaction was highest near to paths, and there was enrichment in phosphorus and (to a lesser extent) nitrogen in areas adjacent to paths. He also found that phosphorus levels were the best predictor of *Lolium* colonization, but did not speculate on the origin of the phosphorus input. Comparison with data presented above leads one to suspect that canine faeces may have been involved.

Unfortunately the Headley Heath results above cannot distinguish between effects of trampling and eutrophication on the heathland vegetation. The replacement of heather by grasses could be attributed to trampling or enhanced nutrient input; in reality both effects are probably at work, and it would take a designed experiment (as opposed to a survey) to isolate the relative importance of these two effects.

Acknowledgement

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The flora and fauna of Elmstead Wood and Sundridge Park, Bromley, south-east London, in the 1940s, with some earlier and later records

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Summary

An account is given of the flora and fauna of the area, close to the north-east edge of Bromley in the London Borough of that name, comprised of the wooded parkland of Sundridge Park, nowadays a well known golf-course, and the adjacent broad-leaved woodland of Elmstead Wood, as it was in the 1940s, a decade when it was in the process of being engulfed by the inexorable spread of urban sprawl into the Kentish countryside from London. Until now, little has been published about the wildlife of this important open space on the outskirts of suburban south-east London. It is hoped that the present paper will stimulate future study by local naturalists.

Details are presented in a systematic list of 210 species of higher plants; 24 species of mammals, reptiles and amphibians; 82 species of birds (55 of them breeding) and 101 species of Lepidoptera, including 29 species of butterflies, recorded in the area; plus some miscellaneous records of other insect orders. Records from earlier and later periods known to the author are also included.

Some historical and descriptive information concerning the area is given and a short discussion of the more interesting wildlife features concludes the paper.

Introduction

In 1938, when I was seven years old, my parents moved from Lewisham to a newly built house at the north-east edge of Elmstead Wood. It was this close proximity to the wood that led me to a growing awareness of its varied bird-life and to become by 1940 an active bird-watcher.

At that time the outward spread of urban London into north-west Kent had just reached the northern boundaries of Elmstead Wood and, immediately to the south and adjacent to it, the open, hilly terrain of Sundridge Park. The Second World War (1939–45) checked further urban development until 1948 when the then open, arable fields of nearby Coldharbour Farm, Mottingham, one of the old County of London's last working farms, were swallowed up by new housing estates. London's last working farm was Woodlands Farm on the north-eastern slopes of Shooters Hill, which survived into the 1960s at least (Burton 1992). Such urbanization subsequently spread deeper into Kent, leaving Elmstead Wood and Sundridge Park more and more isolated from the countryside which had completely surrounded them before1938.

A perusal of Sheet 6 of the Old Series of Ordnance Survey one inch to the mile maps (Sheet 80 of the David & Charles edition), published in January 1819, reveals that both Elmstead (then spelt Elmsted) Wood and Sundridge (then spelt Sunderidge) Park lay in a delightfully rural setting. The nearest town, Bromley, a few kilometres to the south-west, was only a fraction of the size it became in the early 1920s, when there was still much unbuilt-on countryside, and far smaller than its present size. In fact, Bromley today is virtually a suburb of London.

Probably because there was so much other varied and interesting countryside to explore, both Elmstead Wood and Sundridge Park seem to have escaped the attention of the many active late Victorian naturalists living in the south-east London and north-west Kent areas, until the eminent ornithologist J.A. Walpole Bond took up residence in Bromley in the 1930s His interest was entirely ornithological and he gave a good account (Walpole Bond 1901) of the bird-life of Elmstead Wood and Sundridge Park at the turn of the century. However, apart from isolated published records of, for example, water shrew *Neomys fodiens* in Sundridge Park in 1894 by A.S. Kennard (Bromley Naturalists' Society 1895), the others seem to have rarely visited this area. This is a pity, as there were some first-rate botanists and entomologists active in neighbouring areas, such as Hayes and Keston, and Chislehurst.

From the early 1930s until 1940, Elmstead Wood and Sundridge Park appear to have been even more neglected. Apart from my friends, I never encountered any other naturalists there in the 1940s. Since 1950 the area has apparently again been largely neglected, apart from sporadic visits by mammalogists and ornithologists, such as L.R. Pierce who made four visits to Elmstead Wood in 1986, between 4 May and 13 July, on behalf of the LNHS woodland breeding bird survey (Palmer 1988). Certainly very few references to this area have hitherto appeared in the pages of the *London Bird Report* and *The London Naturalist.*

However, I am aware that the London Wildlife Trust has been actively advising the Sundridge Park Golf Club on the protection of the pipistrelle *Pipistrellus pipistrellus* and other bats in the Park, particularly those inhabiting the old ice house (Nature Conservancy Council 1989). Unfortunately, through living most of the time in Germany in recent years, I have not had access to the Trust's own publications for more information.

My earliest observations, when I lived in the vicinity from 1938 to 1943, were almost entirely concerned with birds. I should mention at this juncture that although I am confident of the accuracy of all my ornithological observations recorded here, I was very young and inexperienced when I began them in 1940, though my identification skills grew rapidly, aided by bird books from the local library. Moreover, owing to the extremely limited pocket money I received in my schooldays in those years of scarcity, I lacked field-glasses of any kind and relied entirely upon my then excellent eyesight and skill at stalking. This had the inevitable result that until 1943 I overlooked some species, even such birds as the goldfinch *Carduelis carduelis* and nuthatch *Sitta europaea*, which although apparently scarcer then, which, in subsequent years I discovered to be not only present, but quite numerous. It was not until 1944, when I was thirteen and my family had moved to Greenwich, that I actually met another bird-watcher, Graham Phillips, and my ornithological isolation was ended.

From then until just after the war ended it became impossible for me to travel safely to Elmstead Wood and Sundridge Park because of the intensity of the German V1 flying bomb and V2 rocket attacks on my part of London in 1944 and early 1945, dependent as I was on public transport. In fact, my observations over most of the war period were carried out under the restrictions caused by air attacks, including the Battle of Britain (aerial dogfights regularly occurred directly overhead and I often watched them from our garden) in the summer of 1940 and the subsequent aerial Blitz on London. We were bombed out once and I twice underwent the experience of being, with others, machine-gunned from the air during dive-bombing attacks by single aircraft.

In 1946, the war behind us, I was able to resume visits to Elmstead Wood and Sundridge Park by bicycle, often accompanied by my two new-found naturalist friends, from the Roan School at Greenwich, K.H. Hyatt and D.F. Owen. In the same year I was introduced to (and joined) the London Natural History Society by the late R.C. Homes, who had written to me following the publication of some of my bird observations in one of the RSPB's publications, and I was subsequently very kindly loaned a pair of 6x30 binoculars by the late F.J. Holroyde, a member of the Society. I am greatly indebted to both of them.

The particular enthusiasm of Hyatt, Owen and myself at that time was for Lepidoptera, especially butterflies; with bird-watching coming second, and thus most of our visits were concentrated in spring and summer, with only occasional excursions there in autumn and winter. By 1948 other locations in north-west Kent competed for our attention as we cycled farther and farther afield, and by 1949 I became particularly keen on studying the birds and other wildlife of the Thames marshes east of Woolwich. Thus our visits to Elmstead Wood and Sundridge Park became more and more infrequent and ceased altogether by the 1950s, except for one brief look at the latter in August 1958. From late 1953 to 1958 I lived in Oxford and, apart from a brief return to live and work in London in 1959, I have not lived in the London area since.

Location

Elmstead Wood and Sundridge Park lie adjacent to each other in the London Borough of Bromley, some 14 km south-east of At Paul's Cathedral, on opposite sides of the railway line from London to Tonbridge, Kent, where it disappears under the tunnel between Grove Park and Elmstead Woods Stations (Figure 1). Sundridge Park is bordered to the south-west by the north-eastern edge of the town of Bromley. Using Plant's (1993) tetrad references, Elmstead Wood and Sundridge Park both lie within tetrads TQ47A and TQ47F.

Nowadays Elmstead Wood occupies 39 hectares and Sundridge Park about three times that area: much the same size as they were around 1800. According to the four inches to one mile OS map of 1924, Sundridge Park was bounded on the south-west by Park Wood, now much reduced in size, and just beyond by the gardens on the north-eastern outskirts of Bromley; and on the south-east side by Logshill Wood, some of which apparently still survives. To the north-west, north and north-east, in 1924, Sundridge Park and Elmstead Wood were bordered by an extensive patchwork of farmland and, around Mottingham, sports fields as well. To the east, around the old hamlet of Elmstead, and out towards Chislehurst, there was a mixture of fragmented woodland, orchards, parkland, small fields, and old houses with large gardens. The boundary between Elmstead Wood and Sundridge Park was not well defined, merging through the minor woodlands of High Grove and Rockpit Wood into Sundridge Park proper. For my purposes, I always treated the railway line as the boundary, and therefore included High Grove and the southern part of Rockpit Wood as being in Sundridge Park.

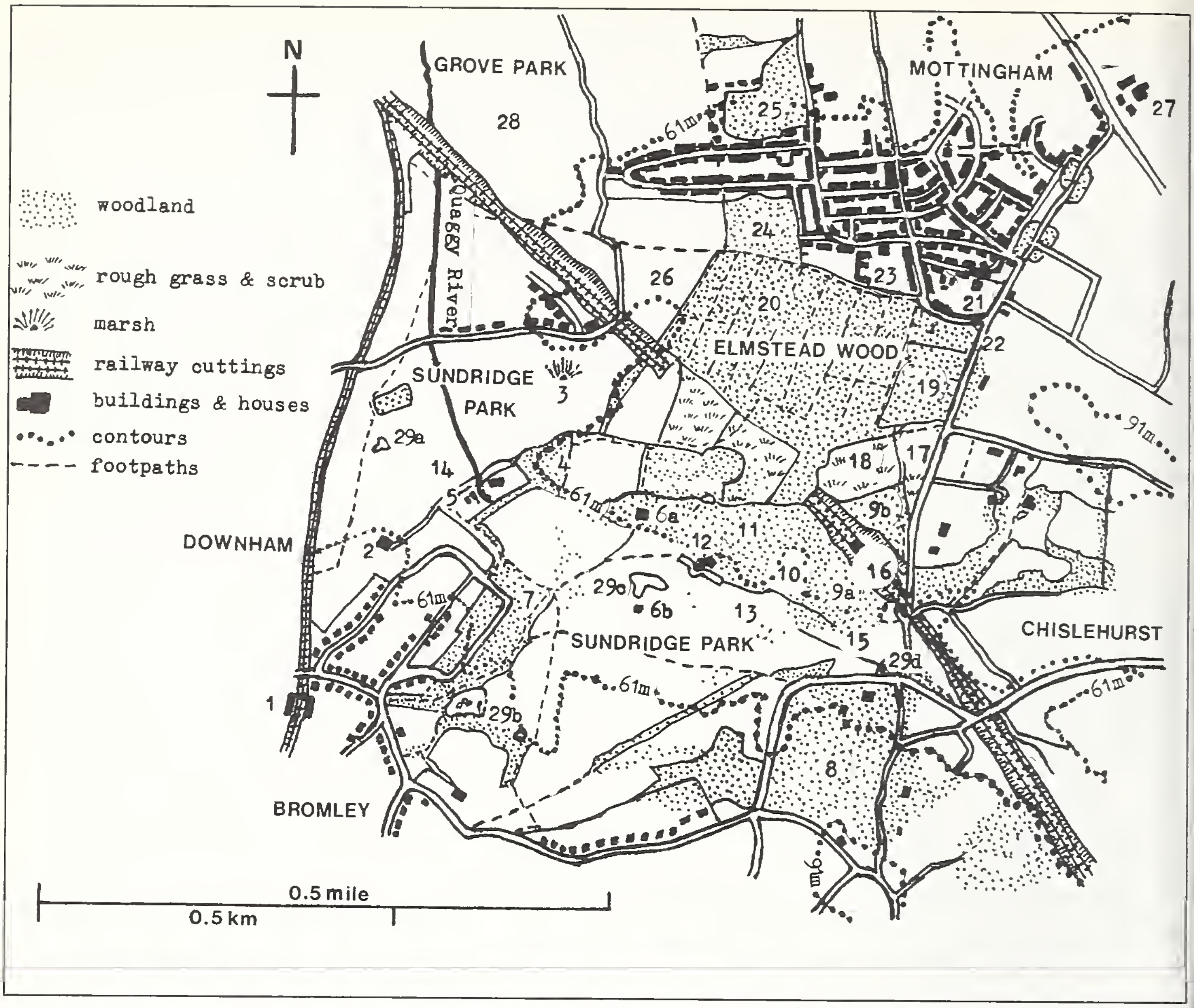


FIGURE 1. Elmstead Wood and Sundridge Park *c.*1938.

1. Sundridge Park railway station. 2. Sundridge Park golf clubhouse. 3. 'The Spotted Orchid Marsh'. 4. Garden Wood. 5. Horticultural nursery. 6a, 6b. Icehouses. 7. Park Wood. 8. Logshill Wood. 9a, 9b. Rockpit Wood. 10. Botany Bay. 11. High Grove. 12. Sundridge Park Mansion. 13. Sundridge Park East Golf Course. 14. Sundridge Park West Golf Course. 15. Kyd Brook. 16. Elmstead Woods railway station. 17. 'The Vetch Field'. 18. 'The Strawberry Field'. 19. Coppiced area. 20. Elmstead Wood. 21. Elmstead Knoll. 22. Elmstead Lane. 23. School. 24. Marvels Wood. 25. Lower Marvels Wood. 26. Grove Park Cemetery. 27. Coldharbour Farm, Mottingham. 28. Chinbrook Meadows. 29a, 29b, 29c, 29d Lakes or ponds.

In the early 1800s a tongue of woodland extended northwards from the north-west corner of Elmstead Wood known as Marvels Wood. In the 1924 map this wood is shown divided into two roughly equal parts by a field, the northernmost being called Lower Marvels Wood.

When I came to live at the edge of Elmstead Wood in 1938, both portions of Marvels Wood had only recently been largely surrounded by a new London County Council housing estate, yet much of the existing ground vegetation had been more or less trampled out of existence by the pressure of the local human inhabitants, many of whom came from congested areas of inner London. I found little of ornithological interest in these woods in the 1940s and therefore did not often visit them. Elmstead Wood was always referred to by the locals as Elmstead Woods, rather than in the singular as used on the maps. I have opted for the singular in this paper.

Since 1949 Elmstead Wood and Sundridge Park have become surrounded by other large housing estates, especially to the east between Elmstead and Chislehurst. These have replaced most of the old woodland fragments, orchards and large gardens, and nearby Coldharbour Farm, Mottingham, one of the last working farms in the old County of London (Fitter 1945: 188), which was operational until at least 1948. I always saw flocks of lapwings *Vanellus vanellus* there in the 1940s and twice, in 1942, a soaring buzzard *Buteo buteo*.

Description of the area

Elmstead Wood

Forming the northern part of the area covered by this paper, Elmstead Wood is an ancient wood (Spencer 1986) very roughly broadly rectangular in shape and lies between 61 and 91 metres (200 and 300 feet) above sea level, mainly on the Blackheath Beds; the rest, particularly the north-east corner, is on London Clay. Originally it was an oakwood (mainly *Quercus robur)* and was predominantly still so in the 1940s. However, silver birch *Betula pendula* was co-dominant in parts of the wood, especially the western sections and the eastern fringe. Hornbeam *Carpinus betulus* was also numerous in other parts and there were large stands of sweet chestnut *Castanea sativa*, apparently planted, in the north-central section, from which I used to harvest in the war years, when a boy, together with many other people, large quantities of chestnuts. These chestnut plantations were largely bare of ground flora and secondary vegetation, and were much trampled. Here and there sycamore *Acer pseudoplatanus* and hawthorn *Crataegus monogyna* flourished, and there were also some extensive stands of bracken *Pteridium aquilinum* and dense patches of bramble *Rubus fruticosus* and honeysuckle *Lonicera periclymenum*, and smaller ones of broom *Sarothamnus scoparius* and gorse *Ulex europaeus*. Rosebay willowherb *Chamaenerion augustifolium* was conspicuous in some of the clearings in the western part of the wood in the late 1940s), and was distinctly more widespread by 1946. Judging by some notes supplied by L.R. Pierce in 1986 to K.H. Palmer for the LNHS woodland breeding birds survey, Elmstead Wood looks much the same nowadays, except that some at least of the undergrowth has been thinned and is therefore more patchy. The drainage ditches still exist and contain some water.

At the beginning of the Second World War, a copse at the north-east corner of Elmstead Wood, adjoining Elmstead Lane, was fenced off from the public and the hazels *Corylus avellana* growing there were coppiced, leaving scattered oaks as standards. Silver birch and sallows *Salix* spp. also grew in considerable quantity, together with bramble and honeysuckle, at least in the late 1940s. After the war, coppicing was abandoned, and the fence fell into disrepair and was pulled down in places by members of the public. Thus, in 1946, for the first time I, too, was able to gain access and, not surprisingly, it proved to be one of the best parts of the wood from the point of view of wildlife interest. Butterflies flourished, including small populations of pearl-bordered fritillaries *Boloria euphrosyne* and grizzled skippers *Pyrgus malvae*, and it was frequented by hawfinches *Coccothraustes coccothraustes*, wood warblers *Phylloscopus sibilatrix*, and the other leaf-warblers, plus whitethroats *Sylvia communis*, blackcaps *S. atricapilla* and garden warblers *S. borin*. Unfortunately, on 20 November 1948 I was really saddened to find the coppice being cleared by a bulldozer for the construction of a sports ground.

'The Strawberry and Vetch Fields', Elmstead Wood

These names were used by my friends and myself for two adjacent fields at the south-east edge of Elmstead Wood and were regarded by us as forming part of the wood. In fact, though the Strawberry Field, the westerly of the two was, I recall, the name by which it was known by local people when I lived there in the early 1940s because of the abundance of wild strawberry *Fragaria vesca* plants there. Eating the fruits often slowed our progress through the field in June! By the late 1940s it was becoming overgrown with invading bramble, hawthorn and dog rose *Rosa canina* which were crowding out the few bee orchids

Ophrys apifera which still grew there in 1946, and also the grizzled skipper butterflies. With plenty of cover for nesting, it was a favoured haunt of grey partridges *Perdix perdix*, warblers, linnets *Carduelis cannabina* and yellowhammers *Emberiza citrinella*. It was built over with houses in the 1960s.

The Vetch Field, an open meadow between the Strawberry Field and Elmstead Wood, was so called by us because of the profusion of vetches growing there, such as common vetch *Vicia sativa*, tufted vetch *Vicia cracca*, common yellow vetchling *Lathyrus pratensis* and bird's-foot trefoil *Lotus corniculatus*. In view of the abundance of their foodplants, it will not be surprising to learn that it held fine colonies of such butterflies as the dingy skipper *Erynnis tages* and common blue *Polyommatus icarus*, and such day-flying moths as the burnets *Zygaena filipendulae* and *Z. lonicerae*, burnet companion *Euclidia glyphica* and latticed heath *Semiothisa clathrata*.

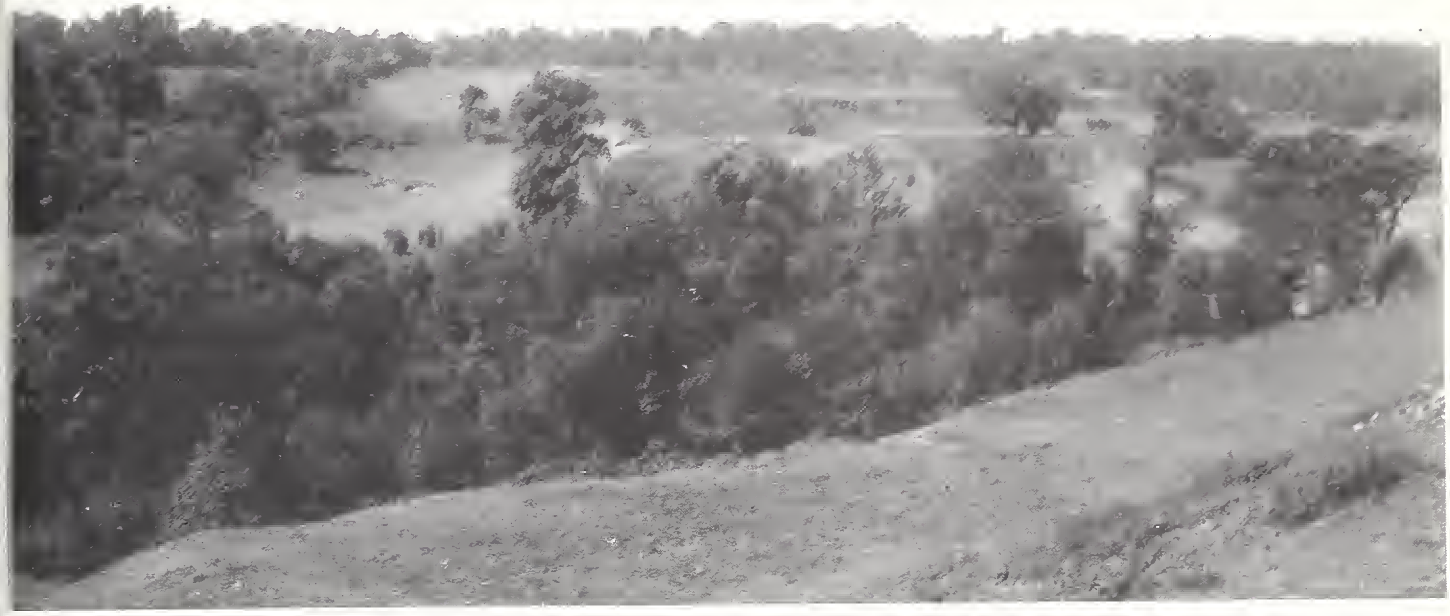
Sundridge Park

Immediately south of the 'Strawberry Field' and overlooking Elmstead Woods railway station was a northern fragment of the once more extensive Rockpit Wood. The remaining fragment of the wood on the other side of the railway was divided from the small woods of High Grove by a combe called Botany Bay which is shown on the 1924 OS four inches to a mile map. These broad-leaved woods were good for common butterflies, such as the brimstone *Gonepteryx rhamni*, orange-tip *Anthocharis cardamines*, holly blue *Celastrina argiolus* and comma *Polygonia c-album*.

The south-west facing slopes of Botany Bay consisted of a couple of narrow grassy terraces on sandy soil (see foreground of Figure 2) heavily grazed by a strong colony of rabbits *Oryctolagus cuniculus*. Here such wild flowers as common stork's-bill *Erodium circutarium* and bird's-foot trefoil flowered in plenty and were frequented by brown arguses *Aricia agestis*, dingy skippers and other butterflies.

Around the turn of the century when Walpole Bond (1901) explored Sundridge Park and Elmstead Wood they were important game preserves and were well keepered. Sundridge Park proper, which also lies largely on the Blackheath Beds, was private parkland belonging to the eighteenth-century mansion which eventually became a hotel, but is now a management training centre. Sundridge Park Golf Club, whose course now occupies much of the Park (Figure 2), was formed in 1901 and was formally opened on 25 April 1903. The players in the first match were the then prime minister, The Rt. Hon. A.J. Balfour, H.W. Foster, MP, and the leading British golfers James Braid and Alex Herd (Moor 1988). Sundridge Park has one of those golf-courses which blends in well with the natural features of the landscape and has left large patches of the original parkland habitat of grassland with scattered trees (oaks, birches, elms *Ulmus*, etc.), scrub and spinneys intact—at least it did up to 1958 (Figure 2). The closely mown fairways provided good feeding areas for such invertebrate predators as thrushes and corvids, while the sandy bunkers were sometimes colonized by mining bees *Andrena* and *Halictus* spp., and digger wasps *Sphecidae*. Between the fairways, the various semi-natural 'roughs' were good habitats for wildlife in the 1940s, including grey partridges and a variety of lycaenid (blue) butterflies.

In the north-west corner of the Park, between New Street Hill and the north-west end of the railway tunnel, there is a shallow valley. In the 1940s the bottom of this valley was very wet and, because of the large colony of common spotted orchids *Dactylorhiza fuchsii* D.F. Owen and I discovered growing there in June 1946, we named it the 'Spotted Orchid Marsh' (Figure 3). In the late 1940s it was in the process of being invaded by hawthorn scrub, but, as the photograph taken in 1947 shows, there was still plenty of open ground. As well as the orchids, a profuse growth of sun spurge *Euphorbia helioscopia* and greater bird's-foot trefoil *Lotus uliginosus*, plus such plants as marsh thistle *Cirsium palustre* and self-heal *Prunella vulgaris* were a feature of this small marsh. On my visit to this site on 24 August 1958 it had almost dried out, the hawthorn scrub was very much denser and there was a good deal of great willowherb *Epilobium hirsutum* and other tall vegetation.



IGURE 2. Looking south-westwards across Sundridge Park Golf Course from Botany Bay. June 947. Brown argus butterfly *Aricia agestis* habitat in the foreground.

Photo: J.F. Burton.

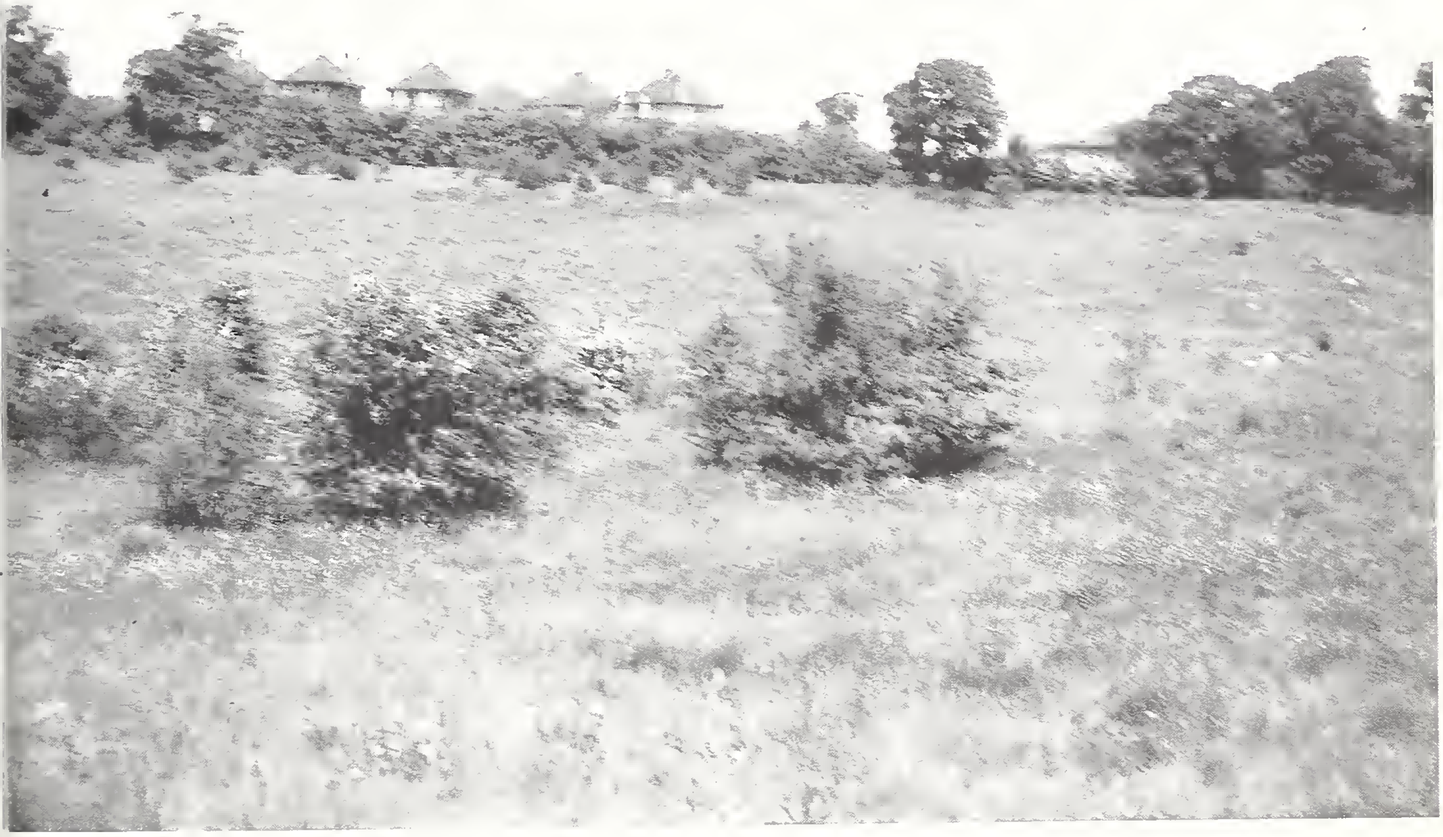


FIGURE 3. 'The Spotted Orchid Marsh', Sundridge Park, June 1947. Then a site of large colonies of ommon spotted orchids *Dactylorhiza fuchsii*, and subspecies *decreta* of the five-spot burnet moth *Zygaena trifolii.*

Photo: J.F. Burton.

During a necessarily, at that time, brief search, K.H. Hyatt and I failed to find any trace o the common spotted orchids. Apart from the plants, the marsh was notable for its thei flourishing population of the marsh subspecies *decreta* of the five-spot burnet moth *Zygaena trifolii*, now apparently extinct in Kent and the London Area, and also as a possible breeding site of the red-backed shrike *Lanius collurio*.

Not far from the Spotted Orchid Marsh, close to Elmstead Wood, there was a small area of broom *Sarothamnus scoparius* where I once saw a green hairstreak butterfly *Callophrys rubi*. Clumps of common gorse *Ulex europaeus* could be found here and there, and there were quite extensive tracts of bracken *Pteridium aquilinum* in some places, such as on the hill alongside Elmstead Woods railway station. A few ponds or lakes are to be found, one of which, at the south-western extremity of the Park near Sundridge Park railway station is quite big and mainly surrounded by a small wood known as Park Wood. Unfortunately we never visited this pond or, indeed, that corner of the Park. The only pond we looked a fairly regularly was the one near the mansion which had good aquatic and marginal vegetation. This is illustrated by a colour photograph in the NCC (1989) booklet *On course conservation*. Here we found a good population of dragonflies and the brown china-marl moth *Elophila nymphaeata*. There was also a small reed-fringed pond at the eastern end o the Park which used to hold a pair of moorhens *Gallinula chloropus* and where, in January 1949, I saw a pair of mallard *Anas platyrhynchos*. I only remember one small stream in Sundridge Park, the Chinbrook; here the water shrew used to be seen in the 1890s and the 1940s.

The wooded area in the south-east corner of Sundridge Park was Logshill Wood; it lay off our usual beat and so little of significance concerning it was recorded in my journals fo the 1940s, but its wildlife inhabitants were presumably little different from the other wood in the Park which we did explore more fully.

The climate of the 1940s

The 1930s and 1940s saw the culmination of the long period of mainly natural climati amelioration in western, especially north-western, Europe which developed in the latte part of the nineteenth century. In contrast to the distinctly maritime (warmer, but wette with mild winters) climate of most of this amelioration they were decidedly Continental i character, with frequent very warm summers and cold winters. The summers of 1945 1947 and 1949 were especially fine and hot, whilst the winters of 1939/40, 1940/41, 1941 42, 1944/45 and 1946/47 were markedly cold, particularly the last mentioned. As a consequence of the cold winters, the springs were frequently late, but often fine and sunny whe they arrived. The autumns, too, tended to be fine and mild.

With the arrival of the 1950s the climatic amelioration began to wane, although this wa most noticeable in Arctic and subarctic zones. Nonetheless, in Britain this decade tende to be characterized by rather cold springs, rather wet and sunless summers and autumns and mild, wet winters. The splendid spring and hot summer of 1959 was a long-awaite exception.

SYSTEMATIC LISTS OF SPECIES

EW = Elmstead Wood, SP = Sundridge Park.

Higher plants

The following notes are of those species which attracted my notice and those of K.H. Hyatt and D.F. Owen, my usual companions on excursions to Elmstead Wood and Sundridge Park in the 1940s. We made no attempt to undertake a thorough survey of the flora. A few earlier and later records from other sources are included, but I have not made an exhaustive search of the published literature. The plant sequence and nomenclature follow that of Burton (1983) and the indications of frequency are largely subjective assessments made in 1946–1948.

Bracken *Pteridium aqilinum:* locally abundant.

Larch *Larix decidua:* frequent in SP.

Scots pine *Pinus sylvestris:* locally frequent in SP.

Yew *Taxus baccata:* occasional in SP.

Wood anemone *Anemone nemorosa:* locally abundant in EW, carpeting the ground in some places, such as the former coppiced area destroyed by bulldozing in November 1948. Locally common in SP.

Meadow buttercup *Ranunculus acris:* common in SP and in the 'Vetch and Strawberry Fields', near Elmstead Woods railway station.

Creeping buttercup *R. repens:* common.

Bulbous buttercup *R. bulbosus:* common in the 'Vetch and Strawberry Fields' at EW, and especially so in SP.

Lesser celandine *R. ficaria:* common, especially in the former coppiced area of EW.

Common or **corn poppy** *Papaver rhoeas*: casual in SP.

Fumitory *Fumaria officinalis:* locally plentiful in SP.

Charlock *Sinapis arvensis:* frequent on disturbed ground in SP.

Shepherd's purse *Capsella bursa-pastoris:* casual in SP and around the edges of EW.

Lady's smock *Cardamine pratensis:* locally plentiful in SP, such as in the 'Spotted Orchid Marsh' and amongst the wet vegetation at the foot of the hill between Elmstead Woods railway station and the golf-course.

Garlic mustard *Alliaria petiolata:* common.

Hedge mustard *Sisymbrium officinale:* common.

Common dog violet *Viola riviniana:* locally abundant in EW and SP.

Wood dog violet *V. reichenbachiana:* abundant in EW and locally in the woods of SP.

Common St John's wort *Hypericum perforatum:* common in SP and around the edges of EW.

Red campion *Silene dioica:* common.

White campion *S. alba:* common.

Bladder campion *S. vulgaris:* locally plentiful.

Common mouse-ear *Cerastium holosteoides:* common.

Common chickweed *Stellaria media:* common.

Greater stitchwort *S. holostea:* locally common. Large amount used to flower on the banks of Elmstead Lane just outside EW up to 1948 when the area was bulldozed in November.

Lesser stitchwort *S. graminea:* common.

Common pearlwort *Sagina procumbens:* common in SP.

Three-veined sandwort *Moehringia trinervia:* common in EW.

Sand spurrey *Spergularia rubra:* locally frequent in SP.

Musk mallow *Malva moschata:* plentiful in SP.

Common mallow *M. sylvestris:* common.

Pyrenean crane's-bill *Geranium pyrenaicum:* not seen by us in this area during the 1940s).

Cut-leaved crane's-bill *G. dissectum:* locally common.

Dove's-foot crane's-bill *G. molle:* common.

Herb Robert *G. robertianum:* common.

Common stork's-bill *Erodium circutarium:* common in suitable habitat in SP, such as the sand slopes of Botany Bay (see Figure 2); very common in the 'Strawberry and Vetch Fields' of Elmstea Wood in 1946, but declined subsequently due to the spread of brambles.

(**Wood sorrel** *Oxalis acetosella:* not noticed by us in the 1940s, but we did not especially search for it)

Sycamore *Acer pseudoplatanus:* frequent, particularly in EW.

Field maple *A. campestre:* frequent.

Horse chestnut *Aesculus hippocastanum:* frequent, especially in the large gardens of big house along Elmstead Lane adjacent to Elmstead Wood, where I used to collect conkers in my boyhood

Holly *Ilex aquifolium:* frequent.

Common buckthorn *Rhamnus cathartica:* some present in both EW and SP.

Common gorse *Ulex europaeus:* locally frequent in SP.

Common broom *Sarothamnus scoparius:* plentiful in SP near the Downham end of the railwa tunnel west of Elmstead Woods Station.

Black medick *Medicago lupulina:* abundant in SP.

Common yellow trefoil *Trifolium dubium:* common in SP.

Hop trefoil *T. campestre:* locally plentiful in SP.

White clover *T. repens:* common, especially in SP.

Red clover *T. pratense:* common.

Common bird's-foot trefoil *Lotus corniculatus:* common, especially in SP.

Greater bird's-foot trefoil *L. uliginosus:* common in the 'Spotted Orchid Marsh' in SP.

Hairy tare *Vicia hirsuta:* common in SP.

Smooth tare *V. tetrasperma:* plentiful in SP.

Tufted vetch *V. cracca:* common.

Bush vetch *V. sepium:* plentiful.

Common vetch *V. sativa:* common in the 'Strawberry and Vetch Fields', EW.

Narrow-leaved vetch *V. angustifolia:* common in the 'Strawberry and Vetch Fields', EW and her and there in SP.

Common yellow vetchling (meadow pea) *Lathyrus pratensis:* very common in the 'Strawberry an Vetch Fields' of EW, and also common in SP.

Grass vetchling (grass pea) *L. nissolia:* plentiful in SP.

Bramble *Rubus fruticosus* agg.: locally abundant.

Barren strawberry *Potentilla sterilis:* plentiful in EW.

Silverweed *P. anserina:* common, especially in SP.

Tormentil *P. erecta:* common in SP and in the 'Strawberry and Vetch Fields' of EW.

Creeping cinquefoil *P. reptans:* common in EW and SP.

Wild strawberry *Fragaria vesca:* locally abundant in SP and EW, especially in the 'Strawberr Field', where we often paused to refresh ourselves from the great quantities of ripe fruit in June, a I sometimes mentioned in my journals for 1946 and 1947.

Wood avens (herb bennet) *Geum urbanum:* common.

Agrimony *Agrimonia eupatoria:* common in SP and at the edges of EW.

Field-rose *Rosa arvensis:* fairly frequent in EW and SP.

Dog-rose *R. canina* agg.: frequent in EW and common in SP.

Blackthorn *Prunus spinosa:* frequent.

(**Midland** or **woodland hawthorn** *Crataegus laevigata = oxyacanthoides:* I did not in the 1940 separate this species from the next, but it may well have been present).

Common hawthorn *Crataegus monogyna:* common.

Rowan *Sorbus aucuparia:* some trees in SP.

Whitebeam *S. aria:* a few at least in SP.

Crab apple *Malus sylvestris:* frequent in both EW and SP as I well remember from my early childhood in the 1940s as well as subsequently.

Wall pepper *Sedum acre:* here and there on sunny banks and walls in SP.

Great willow-herb *Epilobium hirsutum:* small clumps in the 'Spotted Orchid Marsh' in SP in the late 1940s had become a dense growth by 1958, choking out the common spotted orchids *Dactylorhiza fuchsii* growing there. This willow-herb also grew around the margins of the pond near the mansion.

Broad-leaved willow-herb *E. montanum:* common.

Rose-bay willow-herb *Chamaenerion angustifolium:* I can remember flowering stands of this handsome plant in clearings and glades in EW from 1938 onwards, a time when it seemed to be unusual enough to attract the special attention of my parents and other adults out walking in the wood. During the war years it steadily increased, so that by 1947 I was writing such comments in my journal as that on 24 June: 'Everywhere (in EW) the rose-bay willow-herb added a rosy glow of colour to the undergrowth'. From the mid 1940s there were large stands of *angustifolium* here and there in SP as well.

Common enchanter's nightshade *Circaea lutetiana:* common in EW and Wooded parts of SP.

Dogwood *Thelycrania sanguinea:* frequent.

Ivy *Hedera helix:* common.

Cow parsley *Anthriscus sylvestris:* common.

Hedge parsley *Torilis japonica:* frequent in SP and around the edges of EW.

Ground elder *Aegopodium sylvestris:* locally common.

Wild parsnip *Pastinaca sativa:* frequent in SP.

Hogweed *Heracleum sphondylium:* common.

Wild carrot *Daucus carota:* frequent in SP.

White bryony *Bryonia dioica:* common, especially in SP.

Dog's mercury *Mercurialis perennis:* common.

Sun spurge *Euphorbia helioscopia:* abundant in the 'Spotted Orchid Marsh' in SP and also in the 'Strawberry and Vetch Fields' at EW.

Wood spurge *E. amygdaloides:* common in EW, especially in the former coppiced area, and in the wooded parts of SP.

Knotgrass *Polygonum aviculare:* common in suitable habitat.

Sheep's sorrel *Rumex acetosella:* plentiful in suitable habitat.

Common sorrel *R. acetosa:* common in suitable habitat.

Curled dock *R. crispus:* common in suitable habitat.

Broad dock *R. obtusifolius:* common in suitable habitat.

Wood dock *R. sanguineus:* common.

Stinging nettle *Urtica dioica:* common.

Wych elm *Ulmus glabra:* frequent in SP.

Common elm *U. procera:* frequent in SP.

Silver birch *Betula pendula:* common; some good stands in EW, where locally co-dominant with oak.

Downy birch *B. pubescens:* plentiful.

Hornbeam *Carpinus betulus:* plentiful, particularly in EW.

Hazel *Corylus avellana:* common.

Beech *Fagus sylvatica:* locally frequent in SP.

Sweet chestnut *Castanea sativa:* large stands in the middle of EW. I have vivid childhood memories of collecting large quantities of the nuts on windy autumn days in the late 1930s and in the war years. Frequent in SP.

Pedunculate oak *Quercus robur* and **sessile oak** *Q. petraea:* we did not systematically separate these two species in the 1940s here, but both were present with *robur* dominant or co-dominant with silver birch in some parts of EW and SP.

Aspen *Populus tremula:* frequent.

Poplar *Populus* sp.; I made no note of poplars in the area in my journals for the 1940s, but Moo (1988) mentions a row of , presumably, Lombardies between the eighteenth and last hole of the East Course and the clubhouse at SP.

Goat willow *Salix caprea:* frequent, especially in the former coppiced area of EW which was destroyed by bulldozers in November 1948.

Common sallow *S. cinerea:* frequent.

Rhododendron *Rhododendron ponticum:* planted in a few places in SP.

Yellow pimpernel *Lysimachia nemorum:* locally common in EW, such as in the former coppice area.

Scarlet pimpernel *Anagallis arvensis:* common in suitable habitat in SP.

Buddleia *Buddleia davidii:* occasionally found around the periphery of EW and SP.

Ash *Fraxinus excelsior:* plentiful.

Greater periwinkle *Vinca major:* noted in flower in EW in 1947.

Common century *Centaurium erythraea:* plentiful in SP.

Field forget-me-not *Myosotis arvensis:* common in the 'Strawberry and Vetch Fields' in EW and i SP.

Early forget-me-not *M. ramosissima:* plentiful in the 'Strawberry Field' , EW, and in SP.

Field bindweed *Convolvulus arvensis:* common wherever habitat suitable.

Great bindweed *Calystegia sepium:* frequent.

Deadly nightshade *Atropa belladonna:* frequent in SP.

Bittersweet *Solanum dulcamara:* common.

Black nightshade *S. nigrum:* common in suitable habitat.

Common mullein *Verbascum thapsus:* a few plants in SP.

White mullein *V. lychnitis:* not noted by me, but R.M. Burton (1983) mentioned a long-establishe population by the railway at EW.

Common toadflax *Linaria vulgaris:* locally plentiful in SP.

Ivy-leaved toadflax *Cymbalaria muralis:* frequent in SP.

Common figwort *Scrophularia nodosa:* frequent.

Foxglove *Digitalis purpurea:* in my journal for 1947 I noted that 'in a few secluded parts of Elmstea Woods I found many foxgloves', and this was the status of this species here throughout the 1940 In SP foxgloves were locally plentiful in that period.

Heath speedwell *Veronica officinalis:* plentiful in both EW and SP.

Germander speedwell *V. chamaedrys:* plentiful in the 'Strawberry and Vetch Fields' of EW and s common in SP in the 1940s that , according to my journal for 24 May 1947, it 'carpeted the groun with vivid patches of blue here and there on banks and slopes'.

Wall speedwell *V. arvensis:* frequent in SP.

Ivy-leaved speedwell *V. hederifolia:* according to my journal entries for 19 April 1946 and 1 Ma 1946 it grew 'in profusion among the brambles in the "Strawberry Field" at Elmstead Woods'.

Common field speedwell *V. persica:* common in SP. On 13 May 1948 I noted in my journal that th plant was 'flowering in some profusion beside a stream' in the Park.

Green field speedwell *V. agrestis:* I noted this species in flower in SP on 7 June 1946.

Common eyebright *Euphrasia nemorosa:* common in SP and the 'Strawberry and Vetch Fields' EW, and also in SP.

Wild thyme *Thymus drucei:* plentiful in suitable habitat in SP.

Self-heal *Prunella vulgaris:* common in SP, including the 'Spotted Orchid Marsh', and frequent in E

Hedge woundwort *Stachys sylvatica:* common.

Black horehound *Ballota nigra:* locally plentiful.

Yellow archangel *Galeobdolon luteum:* plentiful.

Henbit *Lamium amplexicaule:* frequent in disturbed sites.

Red dead-nettle *L. purpureum:* common.

White dead-nettle *L. album:* common.
Ground ivy *Glechoma hederacea:* very common.
Wood sage *Teucrium scorodonia:* locally plentiful.
Bugle *Ajuga reptans:* common, especially here and there in EW.
Greater plantain *Plantago major:* common, especially on SP golf-course.
Ribwort plantain *P. lanceolata:* common.
Harebell *Campanula rotundifolia:* common in SP.
Hedge bedstraw *Galium mollugo:* common in SP and to a lesser extent around EW.
Lady's bedstraw *G. verum:* common in SP.
Heath bedstraw *G. saxatile:* plentiful in suitable habitat in SP.
Goosegrass *G. aparine:* very common.
Elder *Sambucus nigra:* frequent.
Guelder rose *Viburnum opulus:* frequent.
Honeysuckle *Lonicera periclymenum:* plentiful in many places in both EW and SP.
Teasel *Dipsacus fullonum:* frequent in SP.
Field scabious *Knautia arvensis:* frequent in SP.
Devil's-bit scabious *Succisa pratensis:* frequent in SP.
Common ragwort *Senecio jacobaea:* common in SP.
Hoary ragwort *S. erucifolius:* frequent.
Oxford ragwort *S. squalidus:* Occasional on disturbed ground.
Groundsel *S. vulgaris:* common.
Coltsfoot *Tussilago farfara:* occasional.
Golden rod *Solidago virgaurea:* quite frequent.
Canadian fleabane *Conyza canadensis:* frequent on disturbed ground.
Common daisy *Bellis perennis:* common, especially in SP.
Yarrow *Achillea millefolium:* common, especially in SP.
Scentless mayweed *Tripleurospermum maritimum:* frequent on disturbed ground.
Pineapple weed *Matricaria matricarioides:* frequent.
Ox-eye daisy *Chrysanthemum leucanthemum:* common in SP.
Feverfew *C. parthenium:* frequent.
Mugwort *Artemesia vulgaris:* plentiful in appropriate habitat.
Burdock *Arctium minus:* common.
Spear thistle *Cirsium vulgare:* common.
Marsh thistle *C. palustre:* plentiful in the 'Spotted Orchid Marsh' in SP, and occasionally noted elsewhere in damp grassland and woodland clearings.
Creeping thistle *C. arvense:* very common.
Greater knapweed *Centaurea scabiosa:* frequent in SP.
Black or **lesser knapweed** *C. nigra:* common, especially in SP.
Chicory *Cichorium intybus:* plentiful in SP.
Nipplewort *Lapsana communis:* frequent.
Common cat's-ear *Hypochoeris radicata:* common.
Autumn hawkbit *Leontodon autumnalis:* common in SP.
Greater hawkbit *L. hispidus:* frequent in SP.
Lesser hawkbit *L. taraxacoides:* plentiful in SP.
Hawkweed ox-tongue *Picris hieracioides:* frequent in SP.
Goat's-beard *Trapopogon pratensis:* plentiful in SP.
Prickly lettuce *Lactuca serriola:* frequent.
Wall lettuce *Mycelis muralis:* frequent in SP.

Corn sow-thistle *Sonchus arvensis:* frequent in SP.

Smooth sow-thistle *S. oleraceus:* plentiful.

Prickly sow-thistle *S. asper:* frequent in SP.

Hawkweeds *Hieracium* spp.: common, but I did not attempt to distinguish the various species, apart from the next species. However, *H. rigens* has been recorded in EW between 1965 and 1976 (Burton 1983).

Orange hawkweed *H. (Pilosella) aurantiacum:* a small quantity in the 'Strawberry Field' in EW.

Beaked hawk's-beard *Crepis vesicaria:* frequent in SP.

Smooth hawk's-beard *C. capillaris:* common.

Dandelion *Taraxacum officinale:* abundant.

Common Solomon's seal *Polygonatum multiflorum:* in small quantity in EW.

Butcher's broom *Ruscus aculeatus:* frequent in SP.

Common star of Bethlehem *Ornithogalum umbellatum:* one plant in flower in EW near Elmstead Lane, 24 May 1947.

Bluebell *Endymion nonscriptus:* common here and there in Both EW and SP.

Hairy wood-rush *Luzula pilosa:* plentiful.

Southern or **narrow-leaved wood-rush** *L. forsteri:* frequent.

Field wood-rush *L. campestris:* common.

Black bryony *Tamus communis:* common.

Bee orchid *Ophrys apifera:* several plants in flower, well hidden by thick herbage in the 'Strawberry Field' at EW on 22 June 1946. On 21 June 1947 I searched for these plants without success and also failed to find them in subsequent years. I believe they were crowded out by the fast-increasing brambles and other scrub.

Common spotted orchid *Dactylorhiza fuchsii:* on 22 June 1946 I discovered a flourishing colony in a marshy area at the Downham end of SP, quite close to EW (see Figure 3). This species was abundant in the marsh, which D.F. Owen and I thereafter referred to as the 'Spotted Orchid Marsh'. in subsequent years, but it was already being invaded by hawthorn scrub; and when K.H. Hyatt and I paid a visit to the site on 24 August 1958, following a gap of several years, we found that it was much drier and much overgrown with hawthorn, great willowherb and other lank vegetation. In the course of a rather brief search we failed to find any trace of *fuchsii*, but, as flowering was over, we could have overlooked some survivors. In the 1940s some of the plants were white flowered.

Wild arum (cuckoo pint) *Arum maculatum:* very common.

Mammals

Nomenclature follows Corbet and Southern (1977). My assessment of the status of each species in the 1940s appears first, except when preceded by earlier records from other sources. I have not undertaken an exhaustive search of the literature, but later records than mine are given where available to me, together with the source.

Hedgehog *Erinaceus europaeus:* I used to encounter hedgehogs regularly in the early 1940s where lived on the north-eastern edge of EW. On 4 April 1947 I found a dead one in SP and the species was reported from here in 1960 (Teagle 1963). Despite this paucity of records, the hedgehog is presumably quite plentiful in this area, and probably always has been, although overlooked because most visits by observers have been made in daylight.

Mole *Talpa europaea:* I frequently saw molehills in SP in the 1940s and 1940s). and the species was reported as present here in 1966 (Beames 1968).

Common shrew *Sorex araneus:* numerous in SP and, to a lesser extent, in EW in the 1940s. The only later record I have come across is of two dead in discarded bottles in SP by P. Kinnear on 20 February 1966 (Beames 1968).

Pygmy shrew *S. minutus:* in the 1940s D.F. Owen and I frequently found skulls of this shrew in the pellets of little owls and tawny owls, and often encountered dead ones lying on paths.

Water shrew *Neomys fodiens:* reported as an inhabitant of SP by A.S. Kennard in 1894 in List 1 o

Mammalia, Aves & Filices of the Bromley District, published by the Bromley Naturalists' Society in 1895 (also quoted in Grinling et al. 1909). In the 1940s I frequently saw water shrews when I sat on the banks of the Chinbrook, a small stream in SP.

Pipistrelle *Pipistrellus pipistrellus:* I often saw bats, presumably of this species, flying at dusk around the north-east outskirts of EW when I lived there in the early 1940s, and sometimes also in SP. In the latter locality a colony was discovered by the London Bat Group in the 1980s in an old ice house (NCC 1990).

Rabbit *Oryctolagus cuniculus:* numerous in both EW and SP, especially the latter, in the 1940s and up to 1954, when myxomatosis struck. On 24 August 1958, however, K.H. Hyatt and I noticed fresh dung in SP. Subsequently, rabbits were reported from SP in 1960 (Teagle 1963), EW in 1961 (Teagle 1964), EW and SP in 1962 (Teagle 1965) and SP in 1966 (Beames 1968). In the 1940s the rabbit strongholds were in those parts of Rockpit Wood adjoining Elmstead Woods railway station, and on the hillsides above Botany Bay between Rockpit Wood and High Grove (see Figure 2).

Brown hare *Lepus capensis:* occasionally seen by me in SP in the 1940s. One was also seen in SP on 16 October 1960 by V. Green and P.C. Tinning (Teagle 1963).

Red squirrel *Sciurus vulgaris:* I saw one in EW in 1942, the only one I ever met with in this area (quoted in Fitter 1949).

Grey squirrel *S. carolinensis:* fairly numerous in both EW and SP in the 1940s. Subsequently reported to be present in SP in 1960 (Teagle 1963) and in both EW and SP in 1966 (Beames 1968).

Bank vole *Clethrionomys glareolus:* plentiful in SP in the 1940s where D.F. Owen and I used to find skulls in tawny owl pellets.

Field vole *Microtus agrestis:* numerous throughout the area in the 1940s.

Wood mouse *Apodemus sylvaticus:* numerous throughout the area in the 1940s.

House mouse *Mus musculus:* often occurred in houses bordering the north-east edge of EW when I lived there in the late 1940s and early 1940s.

Common or **brown rat** *Rattus norvegicus:* sometimes seen around the northern edges of EW when I lived in the vicinity in the late 1940s and 1940s.

Fox *Vulpes vulpes:* frequently encountered or heard by myself and others in EW and SP in the 1940s. I believe that the reduction in the persecution of foxes and other so-called 'vermin' during the Second World War enabled their populations to recover in this area: they were certainly becoming commoner by the late 1940s. In 1960 a vixen and her cubs were discovered living under a tool shed beside a bowling-green adjoining SP. They had been feeding on the dried blood that was spread on the green as a fertilizer (Teagle 1967). Moor (1988) mentioned that foxes are often seen by golfers.

Weasel *Mustela nivalis:* I occasionally met with weasels in EW during the 1940s, but never a stoat *M. erminea*.

Badger *Meles meles:* Fitter (1945) wrote that 'earths have been reported in recent years from . . . . . Elmstead Woods, Kent' among other localities in the outer London suburbs, and I knew of an occupied sett there in the 1940s. However, Teagle (1969) stated that he 'was unable to confirm the continued presence of badgers at Elmstead Woods or Sundridge Park'. Nevertheless, a few years later Gold (1974) reported badgers in residence at Sundridge (Park?), Bromley in 1972 and 1973.

Reptiles and amphibians

Nomenclature follows that used by Yalden(1965)

Common or **smooth newt** *Triturus vulgaris:* plentiful in the lakes and ponds in SP and others in the area.

Palmate newt *T. helveticus:* plentiful in the lakes and ponds in SP and others in the area.

Common frog *Rana temporaria:* occasionally met with in SP in the 1940s, especially in or around the ponds. Spawn noted most years in that decade.

Common toad *Bufo bufo:* plentiful. In 1941 or 1942 I discovered one living in a hole at the base of an oak which had previously contained a great tit nest.

Common lizard *Lacerta vivipara:* present in at least small numbers in EW and SP in the 1940s.

Grass snake *Natrix natrix:* I reported one I saw in EW on 7 June 1946 to R.S.R. Fitter (1949).

Birds

Nomenclature follows that of *The 'British Birds' list of birds of the western Palearctic*, 1984 as used in the *London Bird Report* for 1993 (Hardwick 1994). As with the previous groups, the assessment of status of each species for the 1940s is mine. Earlier and later information is given where it has been available to me, but I cannot claim to have made an exhaustive search of the published literature, although I have consulted a great deal of it. For the 1940s I have had the benefit of being able to consult my friend Dr D.F. Owen's personal journals. I have also received additional information from my other friend who shared our excursions in that decade, K.H. Hyatt.

Grey heron *Ardea cinerea:* as far as I recall, and our journals record, my friends and I never saw a heron in SP, but Moor (1988) mentioned that early-morning golfers often observed them fishing at the lake beside the twelfth hole fairway on the West Course.

Mallard *Anas platyrhynchos:* J.A. Walpole Bond (1901) reported that Sir Samuel Scott, Bt., bred this species every year in Sundridge Park, 'generally between five and six hundred', and thought that 'a few real wild ones go there in the winter'. A few still appeared there in the 1940s). D.F. Owen watched three circle the Park on 11 April 1947 and then fly off; I encountered a pair on a small reed-grown pond on 23 January 1949—our only records.

Sparrowhawk *Accipiter nisus:* Walpole Bond (1901) stated that this species was not common at the beginning of this century in the Bromley district, which includes Sundridge Park. Those that did breed were usually shot. A pair nested unsuccessfully in 1900 and another pair in 1901 was shot. During the 1940s at least a pair was present in the breeding season in EW and SP most years and, judging by their behaviour, probably nested, although we never actually searched for a nest. This was certainly the case in 1946 to 1948 inclusive.

Buzzard *Buteo buteo:* on 28 September 1946 D.F. Owen watched two, apparently a pair, soaring over SP, one of which later caught a small mammal and carried it off. He tells me that, in fact, he saw this pair three times that year and almost certainly the same pair on 11 April 1947, when he watched them for more than an hour. I know of no other records, but in the morning of 1 November 1947, K.H. Hyatt saw a buzzard fly over nearby Grove Park from the direction of EW and SP.

Kestrel *Falco tinnunculus:* Walpole Bond (1901) stated that two or three pairs usually bred in the Bromley area, but that in 1901 there was no nest in SP as one of the old pair was shot, and although the survivor found a mate they disappeared. He also mentioned that in SP the kestrels usually nested in hollows in trees because of the dearth of old magpie and crow nests. In the 1940s we frequently saw kestrels in the breeding season over both EW and SP, and at least a pair probably nested annually, although we did not actually look for nests.

Grey partridge *Perdix perdix:* Walpole Bond (1901) considered it to be uncommon in the Bromley district and did not specifically mention its occurrence in SP at that time. A few pairs certainly bred in SP and EW's 'Strawberry Field' in the 1940s as we frequently flushed singletons or pairs from likely breeding sites in April, May and early June. Two probable breeding pairs were present in SP in April and May 1947. On 22 June 1946 I flushed a covey in SP which was most likely a family party. In winter I met with coveys in SP numbering seven on 14 December 1946 and 10 on 23 January 1949.

Pheasant *Phasianus colchicus:* without specifying SP, Walpole Bond (1901) remarked that pheasants were 'more or less plentiful in most of the woods' of the Bromley district. At that period, Sir Edward Scott, who lived in the mansion, was a well-known pheasant breeder, and often invited King Edward VII to SP for weekend shoots (Moor 1988). I do not recall ever seeing or hearing them in the 1940s.

Moorhen *Gallinula chloropus:* Walpole Bond (1901) reported that most of the pools and ponds in the Bromley district at that time had a resident pair. In the 1940s a pair frequented a small reed-fringed pond in SP up to at least 1949. More recently, Moor (1988) reported that moorhens inhabit the lake beside the twelfth hole fairway on the West Course.

Lapwing *Vanellus vanellus:* Walpole Bond (1901) saw lapwings in SP in early spring, but stated that they never bred there. I cannot ever recall seeing them there myself, although a flock was regularly to be seen in winter on Coldharbour Farm, Mottingham, less than a kilometre to the north-east, and they or other lapwings presumably passed over SP and EW at times.

Woodcock *Scolopax rusticola:* According to Walpole Bond (1901), a few were generally shot in Elmstead Wood every season at that time. He also wrote that a Mr Packe informed him that a pair bred there in 1900, as the young were seen at the end of the summer. My only record is of two we saw roding near the mansion in Sundridge Park on 25 June 1946.

Common sandpiper *Actitis hypoleucos:* I know of no records apart from Walpole Bond's (1901) report that he saw a single bird by one of the ponds in SP on 18 May 1901.

Black-headed gull *Larus ridibundus:* not reported by Walpole Bond at the beginning of this century, but by the 1940s black-headed gulls flying over SP were a common sight.

Common gull *L. canus:* the same comments apply here as to the previous species.

Herring gull *L. argentatus:* my only record is of one flying with black-headed and common gulls over SP on 23 January 1949.

Stock dove *Columba oenas:* quite common as a breeding species in EW and SP in the 1940s. On 23 January 1949 I noted in my journal that it was noticeably more numerous on that date than the woodpigeon. Around 1900 Walpole Bond (1901) reported that the stock dove was a 'fairly abundant' breeding species in the Bromley district, and in 1900 'knew of fresh eggs as late as September 1st', and in 1901, 'some as early as the end of March'. He also mentioned that some pairs nested in deserted rabbit burrows in an old sandpit beside Elmstead Lane.

Woodpigeon *C. palumbus:* common breeding bird in both EW and SP. Large flocks were often present in autumn and winter in the 1940s, and apparently still so, as in January 1974, R. Farquhar reported seeing 300+ in EW (*LBR* **39**:41). Walpole Bond (1901) mentions the woodpigeon as breeding 'in plenty' in the Bromley district at the turn of the century, and that 'more still appear in the winter'. On 12 September 1901 he found one sitting on a single egg in EW.

Turtle dove *Streptopelia turtur:* Walpole Bond (1901) wrote that this species was a 'fairly common summer visitor — more especially to Sundridge Park', and that was still its status in the 1940s, particularly in the war years, and a few pairs at least presumably nested in both SP and EW, although I never actually looked for or found a nest.

Ring-necked parakeet *Psittacula krameri:* feral colonies of this noisy species only became established comparatively recently in SE London and NW Kent, and so it was not to be seen when we visited this area in the 1940s. The only occurrence I have come across is of a flock of seventeen encountered by W.T.G. Bates in EW on 31 October 1987 (*LBR* **52**:80).

Cuckoo *Cuculus canorus:* reported by Walpole Bond (1901) as common in the Bromley district, it was still very much so throughout the 1940s, especially during the hot summer of 1947. Both D.F. Owen and I noted in our journals for May 1947 how numerous it was in EW and SP.

Barn owl *Tyto alba:* Although he did not specifically mention EW or SP, Walpole Bond (1901) found at least one breeding pair most years in the vicinity of Bromley. In June 1900 he discovered 'a regular happy family in an old and decaying elm not far from this town, consisting of four owlets of this species, five young kestrels, three young jackdaws, and a brood of starling to boot. Later on in the season, in the same tree, a stock dove reared her two squabs'. Neither my friends nor myself ever encountered barn owls in this locality, but then we were not often there at dusk or in the night.

Little owl *Athene noctua:* apparently this owl had not yet reached this area at the time Walpole Bond worked it around 1900, but by 1910 it was reported to have become established at Bromley, and not far away at Hayes and Keston (Homes et al.1957). By the early 1940s at least one pair nested annually in SP; we found a nest in an old oak in 1946 and in a nearby large English elm the following year, both in the middle of the East Golf Course.

Tawny owl *Strix aluco:* not specifically mentioned by Walpole Bond as occurring in EW or SP around 1900, but when I lived on the edge of EW in the late 1930s and early 1940s I often heard them calling from the wood. Curiously, neither my friends nor myself met with tawny owls during our daytime visits in the late 1940s although we often found pellets of this and the last species.

Long-eared owl *Asio otus:* Walpole Bond (1901) stated that it 'breeds within a five-mile radius of

Bromley', and that, according to local gamekeepers, there was a pair in Sundridge Park about 1898. I know of no other records of this owl in this area, but it has probably been overlooked.

Nightjar *Caprimulgus europaeus:* according to Walpole Bond (1901), nightjars were fairly plentiful in the Bromley area around the turn of the century, and he often had them 'come within a foot or two of me, as I lay on the velvety carpet of the woods, during the balmy evenings of June'. They must have declined by the Second World War, however, as the only one I ever encountered in the EW/SP area was one I heard churring in the 1945 breeding season in EW. They still bred in the late 1940s as near Bromley as Barnet Wood, Hayes, where I was taken to see a breeding pair by the late G.E. Manser in 1949.

Swift *Apus apus:* feeding parties were often to be seen circling over both EW and SP in the 1940s, sometimes in very large numbers, as in mid May 1947. Some of them at least presumably nested in the large houses in the adjacent parts of Bromley, as they did in Walpole Bond's day.

Wryneck *Jynx torquilla:* already considered by Walpole Bond (1901) to be 'rather a rare visitor' by the end of the nineteenth century, I never met with it myself, but in 1945 I was informed by a local resident at Sundridge Park that it occasionally passed through the Park in spring and autumn.

Green woodpecker *Picus viridis:* the commonest species of woodpecker in the area in the 1940s and remarkably numerous in both EW and SP in 1946 and 1947. In 1901, however, Walpole Bond considered the next species to be 'perhaps the most abundant of the three'. I often watched them feeding at the numerous hillock-like nests of the turf ant *Lasius flavus* in SP and in the 'Strawberry Field' at Elmstead Wood. I found occupied nests in both EW and SP, and in the latter locality I once saw, on 21 June 1947, a green woodpecker fly over the treetops, screaming in terror and apparently pursued by a sparrowhawk. In plunged onto a tree and when, after some minutes, it had calmed down, it began calling to another green woodpecker somewhere else in the wood, which then answered it. On a visit to SP on 24 August 1958, our most recent visit, K.H. Hyatt and I saw several.

Great spotted woodpecker *Dendrocopos major:* at least as common throughout the 1940s as in Walpole Bond's day. Several pairs certainly bred annually in both EW and SP.

Lesser spotted woodpecker *D. minor:* stated by Walpole Bond (1901) to be quite common in the Bromley district, we met with this species regularly in SP in the late 1940s, but I presumably overlooked it before then. On our most recent visit, 24 August 1958, K.H. Hyatt and I saw a singleton in SP.

Skylark *Alauda arvensis:* occasionally seen flying over outside the breeding season, but a pair or two may have bred in suitable habitat in SP as D.F. Owen noted in his journal for 3 May 1947 one songflighting.

Swallow *Hirundo rustica:* described by Walpole Bond (1901) as 'common enough' in the Bromley district, presumably including SP, it was still so in the latter locality throughout the 1940s, a few pairs at least breeding in suitable outhouses.

House martin *Delichon urbica:* also reported as common in the Bromley district at the turn of the century by Walpole Bond (1901), we often saw them flying over EW and SP in the 1940s, especially at migration times, but never found nests in these localities.

Tree pipit *Anthus trivialis:* A common summer visitor, according to Walpole Bond (1901); throughout the 1940s an average of three pairs nested in SP and one pair in the birch-dominated part of EW.

Meadow pipit *A. pratensis:* frequent autumn and winter visitor in small numbers to SP. Rare in Walpole Bond's day.

Pied wagtail *Motacilla alba yarrellii:* when I lived at the edge of EW from 1938 to 1943 I regularly saw pied wagtails feeding in the roads and I assume a pair or two nested in the vicinity. Throughout the 1940s at least a few pairs bred annually in SP, as also was the case at the turn of the century (Walpole Bond 1901).

Wren *Troglodytes troglodytes:* as common in the 1940s as it apparently was in Walpole Bond's time at the turn of the century. Several pairs at least nested annually in both EW and SP.

Dunnock *Prunella modularis:* described by Walpole Bond (1901) as very common in the Bromley district. Throughout the 1940s several pairs nested annually in both EW and SP. One of the first nests I found in EW as a small boy before the Second World War.

Robin *Erithacus rubecula:* also described by Walpole Bond (1901) as very common in the Bromley district, it continued to be so in the 1930s and 1940s. Several pairs bred annually in and around SP and EW; as with the dunnock, one of the first nests I found in EW as a small boy.

Nightingale *Luscinia megarhynchos:* At the start of this century Walpole Bond (1901) considered that it was 'certainly on the increase, but not as common as one would imagine' in the Bromley district. However, in the 1940s my only records were of one I heard singing in Sundridge Park on 22 June 1946 and another on 21 June 1947 near the 'Vetch Field' in Elmstead Wood. The dates indicate that a pair may have nested in both years.

Redstart *Phoenicurus phoenicurus:* in Walpole Bond's time at the turn of the century this handsome species was 'fairly abundant, even breeding in some of the Town [Bromley] gardens — wherever it can find suitable accommodation'. By the 1940s it had decreased markedly in the district and I never saw it in either EW or SP, although very small numbers doubtless passed through on passage as they did elsewhere in the south-east London area.

Ring ouzel *Turdus torquatus:* the only record of which I know concerns the pair mentioned by Walpole Bond (1901) which was shot by the gamekeeper at Sundridge Park at a pond there during the spring migration 'some years back', and stuffed by him.

Blackbird *T. merula:* common resident, as in Walpole Bond's time.

Fieldfare *T. pilaris:* a frequent winter visitor. On 14 December 1946, for instance, I watched many eating the haws on the hawthorns in the 'Spotted Orchid Marsh' at SP.

Song thrush *T. philomelos:* a common resident throughout the 1940s, but not as numerous, I suspect, as in Walpole Bond's day when he described it in 1901 as very common.

Redwing *T. iliacus:* frequent winter visitor.

Mistle thrush *T. viscivorus:* common, as in Walpole Bond's day. On 14 April 1947 I watched a pair mobbing a little owl in an elm near the mansion in SP: the tables were turned on 22 April 1947 when the same pair was seen by D.F. Owen being chased by a carrion crow. On our most recent visit to SP, 24 August 1958, K.H. Hyatt and I saw a party of thirteen in SP.

Grasshopper warbler *Locustella naevia:* not recorded in the Bromley district by Walpole Bond (1901), except on spring passage on Keston Common. In the early 1940s, I occasionally heard one singing in the spring in SP.

Lesser whitethroat *Sylvia curruca:* Walpole Bond (1901) noted the tendency of this species to fluctuate quite markedly from year to year, remarking that in 1900 he hardly saw one in the Bromley district, but that in 1901 it was 'fairly abundant'. I was aware of similar fluctuations in the numbers of this bird during the 1940s, but in a good year for it I saw and heard it quite frequently in Sundridge Park and around the margins of Elmstead Wood, such as the 'Strawberry Field' and along Elmstead Lane. I do not have any actual breeding records, but it probably nested most years.

Whitethroat *S. communis:* a common summer resident throughout the 1940s in SP and in suitable parts of EW, such as the 'Strawberry and Vetch Fields'.

Garden warbler *S. borin:* Walpole Bond (1901) wrote that this was a 'really common summer visitor, especially last year (1900)' in the Bromley district. It continued to be so in the 1940s.

Blackcap *S. atricapilla:* Walpole Bond (1901) stated that the blackcap was 'fairly common, especially during the present summer (1901)', thus implying that it was rather less common than the previous species in the Bromley district. This was also my impression in the 1940s with regard to EW and SP. I obtained evidence of breeding in both places in that decade.

Wood warbler *Phylloscopus sibilatrix:* 'distinctly abundant' in Walpole Bond's day, the distinctive trill and the less frequently uttered piping song attracted my attention to this warbler in Elmstead Wood in 1940 when I lived close by and had just taken up bird-watching. I spent many hours watching males song-flighting from tree to tree and displaying to the females. In 1946 and 1947 I found at least four singing males. They mostly frequented the areas where birches and sweet chestnuts were dominant and the coppiced area in the north-east part of the wood. Palmer (1988: 150) remarked that this warbler 'still favours woods with scant undergrowth and many of these woods are found closer in to the central area' (of London). On 19 April 1946 I noted in my journal that there were many singing in EW and several in SP; presumably the majority were passing migrants.

Chiffchaff *P. collybita:* Walpole Bond (1901) considered this to be the rarest of the three leaf warblers in the area, but said it nested sparingly in Sundridge Park. By the 1940s , however, it was a common summer resident in EW and SP, but less so than the next species in some years.

Willow warbler *P. trochilus:* a common summer resident in Walpole Bond's day, it was especially abundant in the 1940s. For instance, on 14 April 1947 D.F. Owen and I noted in our respective journals that it was abundant everywhere in EW and SP and by far the commonest songster. No doubt many of those on this date and others in that particular week were passing through to other breeding areas, but at least several pairs bred in both of these localities every year during the 1940s.

Goldcrest *Regulus regulus:* stated by Walpole Bond (1901) to be rare in the Bromley district: he mentioned seeing only one in SP in 1900 (in spring), but knew of a successful nest there in 1901. In the early 1940s it was common in winter and bred in small numbers in EW and SP until the population was greatly reduced by the severe winter of 1946/47. Thereafter it was rarely seen in the remaining years of the decade, except in winter.

Firecrest *R. ignicapillus:* not recorded by me in the 1940s, but two were reported from the Elmstead Wood area during the second half of November 1993 (James 1994).

Spotted flycatcher *Muscicapa striata:* described by Walpole Bond (1901) as very common in the Bromley district. A few pairs appeared to be breeding in SP throughout the 1940s. but I cannot recall seeing any in EW, except in the grounds of Elmstead Knoll and here and there in the large gardens of the big houses along Elmstead Lane.

Long-tailed tit *Aegithalos caudatus:* considered by Walpole Bond to be the rarest of the tits found in the Bromley area, the very few pairs that were present in EW and SP in the 1940s were decimated by the very severe winter of 1946/47. A party of long-tailed tits that I met with in EW on 23 January 1949 I noted in my journal as being 'the first I have seen in these woods for a long time'.

Marsh tit *Parus palustris:* stated by Walpole Bond (1901) to be a fairly common breeding species, usually nesting amongst the roots of elders, I often saw a few birds in the winter months consorting with other tits in both EW and SP, and occasionally in the breeding season. For example, I watched a male singing in birches in EW on 13 April 1948. In winter they tended to feed in areas with plenty of birches and brambles.

Willow tit *P. montanus:* I have no definite records of my own from this area, but a pair was believed to have bred on SP golf-course in 1974, according to the *LBR* for that year (**39**:47,1976).

Coal tit *P. ater:* a few pairs were present in the breeding season in SP in some years at least during the 1940s, and I frequently saw small numbers feeding with other tits in the winter in both SP and EW. Walpole Bond considered it a fairly common species.

Blue tit *P. caeruleus:* a common resident around 1900, it continued so in the 1940s in both EW and SP, roving feeding parties and flocks being numerous outside the breeding season.

Great tit *P. major:* as for blue tit. Walpole Bond specifically mentioned many pairs nesting in SP.

Nuthatch *Sitta europaea:* considered by Walpole Bond to be abundant and increasing in the Bromley district, this species was quite scarce, though resident, in EW and SP in the 1940s, and I have few records of it in my journal for that period.

Treecreeper *Certhia familiaris:* described by Walpole Bond (1901) as common in the Bromley district at that time, especially in Sundridge Park, I considered it to be a plentiful resident in EW and SP throughout the 1940s.

Red-backed shrike *Lanius collurio:* by the 1940s this species had decreased since Walpole Bond (1901) studied the birds of the Bromley district around 1900. He mentioned a pair which nested close to the railway line between Grove Park and Sundridge Park Stations. On 12 June 1947 K.H. Hyatt found a pair in residence among the hawthorns in the 'Spotted Orchid Marsh' in the north-west corner of SP, close to the edge of EW. D.F. Owen and I saw them on other dates up to the end of June, but did not visit the site subsequently until 4 August when I revisited it with F.J. Holroyde, but failed to see either adults or young. Thus, although it was probable that this pair attempted to breed, it was not proved.

Jay *Garrulus glandarius:* scarce in the more rural areas on the outskirts of London at the beginning of the century owing to persecution by gamekeepers, the jay began to increase soon after and especially during the two world wars when persecution was relaxed. However, in 1901 Walpole Bond said it was fairly common in the woods of SP, where, he reported, it was not much persecuted. Several pairs were resident in Elmstead Wood in 1940 when I started bird-watching there, and the species clearly increased through the 1940s both in this wood and Sundridge Park. By 1946 D.F. Owen and I were recording it as numerous in our respective journals, and on 11 April 1947 the first named reported seeing flocks of a dozen or more.

Magpie *Pica pica:* like the jay, the magpie also suffered from the attentions of gamekeepers before the First World War, perhaps even more so. Walpole Bond (1901) considered it practically extinct in the Bromley district and only knew of one having been seen a few years earlier on the Sundridge Estate, but reported that even that was supposed to have been an escaped cage-bird. Although it subsequently recovered due to the gradual relaxation of gamekeeping in many parts of the remaining countryside south of London, it was still a very scarce species in the south-east London area in the first half of the 1940s I knew of no records from EW or SP until the 1950s when the area was colonized along with neighbouring districts. Once it reached the open spaces and large gardens of the suburban districts, the magpie's numbers rapidly increased as it became adapted to them and benefited from the lack of human persecution there.

Jackdaw *Corvus monedula:* Walpole Bond (1901) found a few pairs breeding in SP and also in an old sandpit bordering Elmstead Lane, where they nested in deserted rabbit holes, in company with some stock doves and starlings. I never came across the latter site, which may have become overgrown by the 1940s, but a few pairs still nested in holes in old trees in EW and SP.

Rook *C. frugilegus:* in Walpole Bond's day, rooks were fairly common in the Bromley district, and he knew of several 'fair-sized' rookeries: one of about 50 nests near Grove Park railway station and another of about 40 between there and Sundridge Park railway station. My friends and I regularly saw rooks in the breeding season in EW and SP, sometimes in quite large numbers as in April 1947, but we never located a rookery within the boundaries of the area discussed in this paper.

Carrion crow *C. corone:* owing to intensive gamekeeping at that time, Walpole Bond (1901) stated that this species was very rare. He knew of a nest in SP in the spring of 1899, but both old birds were shot. No others were seen there until the spring of 1901 when a single bird 'frequented the woods for the first half of April, when it vanished. I saw one, too, in February there — which had been trapped — probably its mate'. Walpole Bond went on to remark that: 'were they left alone, I think a pair would nest here every year'. The reduction in the numbers of gamekeepers from the First World War onwards, as described by Homes et al. (1957), gradually led to a recovery of the carrion crow population in the London area, so that it was already a fairly common bird by the time I began serious bird-watching in 1940. Numbers continued to increase throughout the 1930s and several pairs bred annually in the EW/SP area. One pair D.F. Owen and I watched feeding young in EW in the spring of 1947 had built their nest at the top of a tall sweet chestnut tree.

Hooded crow *C. c. cornix:* Walpole Bond (1901) reported that if 'the keepers on the Sundridge Estate are to be relied on, a few turn up in severe winters'. I know of no other records this century from here.

Starling *Sturnus vulgaris:* Walpole Bond (1901) reported that the starling was very common and on the increase at that time in the Bromley area, and, as mentioned above with reference to the jackdaw, he knew of pairs nesting in deserted rabbit holes in an old sandpit bordering Elmstead Lane. Several pairs at least nested in holes in trees in EW and SP throughout the 1940s, and we often saw large flocks of adults and immatures feeding in SP outside the breeding season.

House sparrow *Passer domesticus:* very common in the Bromley district in Walpole Bond's time, it was still so throughout the 1940s. Pairs bred in EW and SP wherever suitable nesting sites were available, including holes in trees. Large flocks frequented the area outside the breeding season, while in May many joined starlings and tits in feeding on the great numbers of defoliating caterpillars of such moths as the green oak roller, mottled umber, November and winter moths.

Tree sparrow *P. montanus:* rare in the Bromley district in Walpole Bond's day, my friends and I do not recall ever seeing this species in EW or SP, although I did sometimes see them at nearby Chislehurst in the 1940s.

Chaffinch *Fringilla coelebs:* a common resident in both EW and SP, as in Walpole Bond's time.

Greenfinch *Carduelis chloris:* Walpole Bond (1901) reported that the greenfinch was 'not very common' at that time, but that 'a few pairs breed in Sundridge Park', and that it was much commoner in winter, when he sometimes saw immense flocks. In the 1940s it was definitely increasing and by the end of the decade had become a common resident in and around EW and SP.

Goldfinch *C. carduelis:* when Walpole Bond (1901) lived in Bromley the numbers of goldfinches and linnets in the district had been reduced by the activities of bird-catchers and they were very rare as breeding species. By the 1940s the numbers of both species were recovering well, but I did not begin to see them commonly in EW or SP or in the Mottingham–Chislehurst area until 1946. They have since become common breeding species throughout this area.

Siskin *C. spinus:* in April 1901 Walpole Bond watched a pair building a nest in SP; on his next visit he found that the nest had apparently been robbed. He considered siskins to be very rare in the Bromley area and my friends and I never met with them during our visits to EW and SP in the 1940s.

Linnet *C. cannabina:* see comments under goldfinch above. By the mid 1940s several pairs nested annually in SP and an occasional pair in the 'Strawberry Field' in EW.

Redpoll *C. flammea:* Walpole Bond occasionally saw a flock in winter in the Bromley district around the turn of the century, and once (1901) located a pair which attempted to breed, but without success. My only records are of a party of 11 I met with in EW on 14 December 1946 and of a flock of about 40 which I watched feeding among birches and brambles beside the path leading to the mansion in SP on 4 April 1947. Also in SP, D.F. Owen saw one at least calling in flight on 11 April 1947.

Bullfinch *Pyrrhula pyrrhula:* described by Walpole Bond (1901) as common in the Bromley district, it was still so in the 1940s. Several pairs were resident in EW and SP, and were often encountered wandering in parties of around half a dozen birds during the winter, sometimes visiting the gardens of adjacent houses.

Hawfinch *Coccothraustes coccothraustes:* Elmstead Wood and Sundridge Park seem to have been strongholds of this large and powerful finch since at least the end of the nineteenth century. Walpole Bond (1901), who described its status in the Bromley district as ' distinctly common', wrote that 'a good many pairs' nested on the Sundridge Estate. He mentioned finding one hawfinch nest 60 feet (18 metres) or so up an oak, and might have passed it by had he not seen the male leave it after feeding his sitting mate. He stated that usually the nest of this species is from 15 to 20 feet (4.5 – 6 metres) from the ground. It was still a quite common resident in EW and SP in the 1940s and I saw them fairly frequently in the breeding season, although I never actually discovered a nest. However, I watched adults collecting food presumably intended for their young. On 1 May 1946 D.F. Owen and I saw a loose flock of about 30 – 40 birds in EW.

Yellowhammer *Emberiza citrinella:* Walpole Bond (1901) reported that a few pairs were resident and nesting in SP, and that was still the case throughout the 1940s.

Insects

LEPIDOPTERA — butterflies and moths

The following is primarily a list of species recorded by K.H. Hyatt, D.F. Owen and myself during the second half of the 1940s. I have not conducted an exhaustive search of published sources for further records, but have consulted Plant (1987 and 1993) on the assumption that any other important ones for EW and SP will have been included by him as a result of his very extensive searches. Any such additional records for periods prior to or subsequent to the 1940s which have come to my notice have been included. As far as I am aware, Hyatt, Owen and myself are the only lepidopterists who seem to have worked EW and SP this century.

The nomenclature followed is that used by Plant (1987) for the butterflies and Plant (1993) for the moths.

BUTTERFLIES

Small skipper *Thymelicus sylvestris:* common in SP and in the 'Strawberry Field' at EW. Although looked for, we never found the Essex skipper *T. lineola* here.

Large skipper *Ochlodes venata:* common throughout.

Dingy skipper *Erynnis tages:* common on the roughs and other grassy slopes in SP, and in the 'Strawberry and Vetch Fields' at Elmstead Wood.

Grizzled skipper *Pyrgus malvae:* common in suitable habitats in SP and in the 'Strawberry and Vetch Fields' at EW where D.F. Owen found a fully grown larva among wild strawberry plants on 14 April 1947.

Clouded yellow *Colias croceus:* the only records I have are from the great immigration year of 1947: I captured a slightly damaged female in SP on 24 June and D.F. Owen saw two there on 21 August. Almost certainly they were not the only ones to occur there that year!

Brimstone *Gonepteryx rhamni:* before I took a serious interest in Lepidoptera in 1946 I often saw males of this species from 1939 onwards flying in and around EW and SP. In the latter part of the decade my friends and I encountered both sexes in good numbers.

Large white *Pieris bassicae:* common most years.

Small white *P. rapae:* as previous species.

Green-veined white *P. napi:* common in both EW and SP.

Orange-tip *Anthocharis cardamines:* fairly common in both EW and SP.

Green hairstreak *Callophrys rubi:* the only record of this species known to me here is of one I saw near clumps of broom at the Downham end of the railway tunnel in SP, close to EW, on 24 May 1947. It is possible that a colony existed in this spot.

Small copper *Lycaena phlaeas:* numerous in most years in SP and in the 'Strawberry and Vetch Fields' at EW. When K.H. Hyatt and I made our brief visit to SP on 24 August 1958 we saw several although it was early evening and cloudy at the time.

Brown argus *Aricia agestis:* common in suitable grassy habitats in SP and in the 'Strawberry and Vetch Fields' at EW.

Common blue *Polyommatus icarus:* status as last species.

Holly blue *Celastrina argiolus:* plentiful in good years for the species in both EW and SP, for example numerous in 1946 and 1947.

White admiral *Ladoga camilla:* this butterfly certainly did not occur in either EW or SP in 1946, but on 5 July 1947 D.F. Owen encountered one in EW and wrote in his journal: '. . . . the first we have seen here. As I expected, the white admiral has spread to Elmstead Woods. There were not any there last year for we searched the woods carefully'. Unfortunately, his and my visits to the area petered out after the spring of 1948 as we extended our area of observations farther and farther into Kent, and never managed to discover if this and other new colonists in 1947, such as the silver-washed fritillary *Argynnis paphia* and the grayling *Hipparchia semele,* really became permanently or temporarily established. It is possible that the white admiral seen flying along the hedges in Westmoreland Road, Bromley, in 1982 (Plant 1987) may have wandered from an established population in SP or EW, although Hayes Common may have been the more likely source as a population was well established there in the mid 1940s.

Red admiral *Vanessa atalanta:* numerous in good years for the species.

Painted lady *Cynthia cardui:* numerous in good years such as 1945, 1946 and 1947.

Small tortoiseshell *Aglais urticae:* common throughout the 1940s.

Peacock *Inachis io:* usually common in both EW and SP in the 1940s. Larvae often common, especially in 1947.

Comma *Polygonia c-album:* occasionally seen in both EW and SP, 1946–9.

Pearl-bordered fritillary *Boloria euphrosyne:* present in small numbers in the former coppiced area of EW from at least 1946 until 1948 when this area was bulldozed in November. On 7 June 1946 I saw one *euphrosyne* in SP.

Silver-washed fritillary *Argynnis paphia:* on 4 August 1947 I saw a female in EW, the only one I ever saw in this area. I know of no other records apart from a fresh male caught at buddleia in a Grove Park garden on 21 July 1949 by K.H. Hyatt.

Speckled wood *Pararge aegeria:* my friends and I never encountered this butterfly in either EW or SP in the 1940s, although, as a result of its recovery and range expansion in Kent during that decade, it had reached the Bromley district by 1946. Although K.H. Hyatt and I, not surprisingly, failed to see any *aegeria* on our brief early evening visit in rather wet weather to SP on 24 August 1958, it is probable that SP and EW were colonized by this species early in the 1950s. The distribution map in Plant (1987) for the period 1980–1986 shows that the speckled wood was by then well established in that part of the 10-kilometre square covering EW and SP.

Wall brown *Lasiommata megera:* quite common most years in SP in the 1940s, especially 1945–7, but I have no records of it from EW.

Grayling *Hipparchia semele:* in the summer of 1947 this butterfly looked as if it was attempting to colonize this area. On 30 July I caught a female in excellent condition on the path leading up to the mansion in SP; then on 4 August I captured another female which was flying low over bracken in EW. The nearest breeding population we knew of at that time was on Hayes Common, 5–6 km to the south, and it seems most probable that these individuals wandered from there in what was an exceptionally fine summer for Lepidoptera.

Gatekeeper (hedge brown) *Pyronia tithonus:* described as fairly common in the Bromley, Hayes and Keston districts at the beginning of the present century by Grinling et al. (1909), this species subsequently contracted its range away from the expanding London suburbs. Nevertheless, it was still locally common in the late 1940s at Hayes and Keston to the south of Bromley, at Petts Wood, just south of Chislehurst, and at Joyden's Wood to the east of Sidcup, but was definitely absent from EW and SP until 1946, when I saw one in EW. Next year, 1947, I was surprised to find gatekeepers flying in good numbers in both EW and SP. Petts Wood, some 3 km to the south-east, would have been the nearest possible source of these colonists, but Hayes Common, between 5–6 km to the south, was also a likely source. On balance of probability, however, I would choose Petts Wood, as the railway line, with its many grassy and scrub-covered embankments, between the southern border of the wood and Elmstead Woods Station, would have provided a very suitable corridor for such expansionary movements to have taken place. Judging by the distribution map in Plant (1987) for the period 1980–1986, the gatekeeper is now established in the EW and SP area.

Meadow brown *Maniola jurtina:* reported in Grinling et al. (1909) to have been generally common in the Bromley district at the beginning of the present century, it was still so at SP and EW throughout the 1940s, I remember meadow browns flying in abundance in the early 1940s in meadows bordering Elmstead Court and Cottage on the east side of Elmstead Lane, close to the north-east corner of EW.

Small heath *Coenonympha pamphilus:* common in the 'Strawberry and Vetch Fields' of EW and in suitable grassy areas of SP.

MOTHS

Almost all our observations were made in the daytime and this is reflected in the following notes.

Six-spot burnet *Zygaena filipendulae:* common in suitable grassy habitats in SP and in the 'Strawberry and Vetch Fields' in EW.

Five-spot burnet *Z. trifolii decreta:* a strong population of this subspecies was discovered by D.F. Owen and myself in late June 1946 in the 'Spotted Orchid Marsh' in the north-west corner of SP, bordering EW (Figure 3). Cocoons spun high up on grasses, etc., which we collected on 22 June 1946 began producing imagines from 24 June onwards into July. On 24 June 1947 I found *decreta* flying in abundance among the flowering greater bird's-foot trefoil (this race's larval foodplant), common spotted orchids, sun spurge and other wild flowers in this marsh, and on 5 July 1947 D.F. Owen reported it to be common there. Unfortunately, D.F. Owen (pers. comm.), to whom I subsequently gave most of my small collection of Lepidoptera, tells me that none of his or my specimens have survived the intervening years, and, as mentioned earlier, the marsh subsequently became overgrown with hawthorn and dried out. Presumably, the burnet population disappeared as a consequence.

Narrow-bordered five-spot burnet *Z. lonicerae:* common in SP and in the 'Strawberry and Vetch Fields' in EW. I noted in my journal on 21 June 1947 that 'I caught and released after examination every member of the burnet colony in the Strawberry Field that came my way. All proved to be *lonicerae.* I was surprised to see that they continued to fly during a heavy downpour of rain'.

Oak eggar *Lasiocampa q. quercus:* the only record I have is of an imago found in EW by D.F. Owen in August 1946.

Yellow-horned *Achlya flavicornis:* imago found by D.F. Owen in EW on 26 March 1947.

Orange underwing *Archiearis parthenias:* often numerous in the late 1940s in the parts of EW with plenty of birch, such as the former coppiced area.

March moth *Alsophila aescularia:* frequently seen.

Large emerald *Geometra papilionaria:* I collected one male imago in EW on 24 June 1947.

Blood-vein *Timandra griseata:* common in both EW and SP.

Red twin-spot carpet *Xanthorhoe spadicearia:* I collected one imago in the coppiced area of EW on 15 May 1948.

Silver-ground carpet *X. montanata:* common.

Garden carpet *X. fluctuata:* common.

Shaded broad-bar *Scotopteryx chenopodiata:* common.

Common carpet *Epirrhoe alternata:* common in SP.

Yellow shell *Camptogramma bilineata*: common.

Common marbled carpet *Chloroclysta truncata:* common.

November moth *Epirrita dilutata:* common. One male imago found on an oak trunk in EW by K.H. Hyatt as late as 27 December in 1947.

Winter moth *Operophtera brumata:* very common. Larvae were often extremely abundant in the late 1940s on oak, sweet chestnut, sycamore, hazel and hawthorn in both EW and SP.

Lime-speck pug *Eupithecia centaureata:* quite common.

Common pug *E. vulgata:* common.

Narrow-winged pug *E. nanata:* as I knew of no patches of ling *Calluna vulgaris* in this area, an imago I found in the 'Vetch Field' at EW on 13 April 1948 had presumably wandered from the Chislehurst district or perhaps Hayes Common, unless it had originated from a larva which fed on a variety of heather growing in a local garden.

Brindled pug *E. abbreviata:* common.

Green pug *Chloroclystis rectangulata:* plentiful; usually the melanic form.

Double-striped pug *Gymnoscelis rufifasciata:* common.

Treble-bar *Aplocera plagiata:* my only records are of two I collected in the 'Strawberry Field' at EW on 5 June 1946 and a note in D.F. Owen's journal for 11 June 1947 that he saw a few in SP.

The magpie *Abraxas grossulariata:* one captured by D.F. Owen in SP on 25 June 1947 is only record I have for this area.

Clouded border *Lomaspilis marginata:* plentiful in EW in the late 1940s. We regularly found imagines quite early in May; for example, D.F. Owen caught one on 7 May 1947 and two on 13 May 1947, J.E. Owen captured two on 17 May 1947, while I saw several on 24 May 1947 and captured one in the coppiced area of EW on 15 May 1948.

Latticed heath *Semiothisa clathrata:* common in the 'Strawberry and Vetch Fields' of EW.

Brown silver-line *Petrophora chlorosata:* quite common in the bracken-dominated areas of EW and SP.

Brimstone moth *Opisthograptis luteolata:* common.

Speckled yellow *Pseudopanthera macularia:* numerous in EW and in the woods of SP in the late 1940s.

Swallow-tailed moth *Ourapteryx sambucaria:* plentiful.

Pale brindled beauty *Apocheima pilosaria:* quite common.

Brindled beauty *Lycia hirtaria:* common.

Oak beauty *Biston strataria:* on 14 April 1947 I found a male resting on an oak trunk in EW.

Spring usher *Agriopis leucophaearia:* common.

Mottled umber *Erannis defoliaria:* common.

Mottled beauty *Alcis repandata:* quite common. One collected in EW by D.F. Owen on 25 June 1947 appeared to be referable to ab. *nigricata* Fuchs.

The engrailed *Ectropis bistortata:* common.

Small engrailed *E. crepuscularia:* our only record is of a male found by D.F. Owen in SP on 14 April 1947.

Common white wave *Cabera pusaria:* common in both EW and SP.

Common wave *C. exanthemata:* common.

Garden tiger *Arctia caja:* larvae numerous.

White ermine *Spilosoma lubricipeda:* larvae numerous and imagines often found.

Buff ermine *S. lutea:* as previous species.

The cinnabar *Tyria jacobaeae:* common throughout the 1940s in SP and in the 'Strawberry and Vetch Fields' of EW. On 5 June 1946 I captured an imago in which the scarlet colour was replaced with orange.

Heart and dart *Agrotis exclamationis:* common in SP.

Large yellow underwing *Noctua pronuba:* numerous in SP and in the 'Strawberry and Vetch Fields' at EW. Imagines often disturbed from the vegetation in daytime.

Setaceous Hebrew character *Xestia c-nigrum:* plentiful.

Square-spot rustic *X. xanthographa:* plentiful.

Beautiful yellow underwing *Anarta myrtilli:* one caught at EW by D.F. Owen on 13 May 1947, like the narrow-winged pug already mentioned, may have flown there from the Chislehurst area or Hayes Common where tracts of ling *Calluna vulgaris* are to be found.

Grey arches *Polia nebulosa:* D.F. Owen found a female at rest on a dead tree stump in SP on 11 June 1947.

Bright-line brown-eye *Lacanobia oleracea:* plentiful.

Small quaker *Orthosia cruda:* common.

Blossom underwing *O. miniosa:* I collected one last instar larva from oak in EW on 15 May 1948 where D.F. Owen reported the larvae to be numerous in 1946–7.

Common quaker *O. cerasi (stabilis):* common.

Clouded drab *O. incerta:* common.

Hebrew character *O. gothica:* common.

Common wainscot *Mythimna pallens:* plentiful in SP.

Grey dagger *Acronicta psi:* occasionally found on trees in EW and SP.

Knot grass *A. rumicis:* my only record is of an imago found by K.H. Hyatt in SP on 26 May 1947.

The dun-bar *Cosmia trapezina:* we sometimes found larvae in EW.

Dark arches *Apamea monoglypha:* we quite often found imagines at rest on tree trunks as, for example, two males I collected on 21 June 1947.

Small yellow underwing *Panemeria tenebrata:* common in suitable grassy habitats in SP and in the 'Strawberry and Vetch Fields' at EW.

Green silver-lines *Pseudoips fagana:* two imagines found by D.F. Owen at rest on oak trunks at the edge of EW on 7 June 1946 is the only record I have of this species in this area.

Silver Y *Autographa gamma:* common most years, especially in 1947.

Mother Shipton *Callistege mi:* in the 1940s this moth was numerous in SP and in the 'Strawberry and Vetch Fields' at EW.

Burnet companion *Euclidia glyphica:* also numerous in SP and in the 'Strawberry and Vetch Fields' at EW. In the exceptionally early season for the species of 1947 D.F. Owen caught a fresh imago on 5 July in SP and speculated in his journal that it might have been a second generation individual.

The four-spotted *Tyta luctuosa:* according to D.F. Owen's journal for 1947, K.H. Hyatt saw an imago of this now seriously declining species (*Red Data Book* Category 3) in SP.

Brown china-mark *Elophila nymphaeata:* on 24 August 1958 K.H. Hyatt and I found this pyralid moth to be quite numerous in the semi-aquatic and marginal vegetation surrounding a stagnant pond in SP.

Green oak tortrix *Tortrix viridana:* abundant in EW and the woods of SP.

Green longhorn *Adela reaumurella:* usually very numerous in the 1940s around hazel, oak and other broad-leaved trees in EW and SP.

Other insect orders

My records of other insect orders are extremely fragmentary as in 1947 I was only just beginning to expand my interest to insects other than Lepidoptera. However, the following attracted my attention and were recorded in my journal.

ODONATA — dragonflies

In the summers of 1946 and 1947 I noted that several different species of dragonflies and damselflies were to be seen on the wing around the ornamental pond near the mansion in Sundridge Park, but made no attempt to identify them, apart from the broad-bodied chaser *Libellula depressa*, which both D.F. Owen and I recorded there in 1947.

ORTHOPTERA — grasshoppers, bush-crickets and crickets

Nomenclature is that of Marshall and Hayes (1988). My special interest in this insect order did not arise until 1957, and thus my only visit to this area when I specifically searched for Orthoptera was on 24 August 1958, between 5.30 and 6.30 p.m. on a cloudy evening, following heavy afternoon rain. After a search in long wet grass at the edge of the former 'Spotted Orchid Marsh' in Sundridge Park I managed to find two female common green grasshoppers *Omocestus viridulus*. A search of higher grassland above this marsh revealed that the meadow grasshopper *Chorthippus parallelus* was numerous.

My only other records relate to the period 1938–1942 when I lived with my family at the north-east corner of Elmstead Wood, close to Elmstead Knoll House. I have vivid memories from that childhood period of catching both *parallelus* and the field grasshopper *C. brunneus* in a strip of rough grassland between our garden and Elmstead Wood. Both species were abundant there in the fine hot summers of that time.

DIPTERA — two-winged flies

My only Diptera notes from this area refer to the bee-flies Bombyliidae. I recorded two *Bombylius major* hovering in the 'Strawberry Field' at EW on 13 April 1948, and saw many on the same date in SP, plus a single *B. discolor*.

HYMENOPTERA — bees, wasps and ants

On 13 April 1948 I made an effort to identify the bumble-bees flying in the 'Strawberry Field' at EW, recording *Bombus pascuorum*, *B. lucorum* and *B. terrestris* as all being common there.

COLEOPTERA — beetles

Common tiger beetle *Cicindela campestris:* fairly numerous in EW, especially the 'Strawberry Field' and often abundant in SP in the spring.

Poplar leaf beetle *Chrysomela populi:* very numerous in EW in late April and May 1947.

Discussion

Elmstead Wood and Sundridge Park were both home to a rich and varied community of plants and animals right up to the late 1940s. From that time onwards they became increasingly isolated from the Kentish countryside beyond Orpington and the River Cray as the post-war building boom filled up most of the former countryside around them and the Chislehurst district. Already in the late 1930s much of the farmland which existed to the north and north-west of them disappeared under large housing estates, adding to the urban growth of neighbouring Bromley which, with the coming of the railways had already spread a lot by the end of the nineteenth century. By 1970 Elmstead Wood and Sundridge Park had become completely surrounded by built-up areas, the only terrestrial links with The National Trust property of Petts Wood and the open spaces and woods of the Chislehurst district to the south-east now being the railway embankments between Elmstead Woods Station and Petts Wood, and the countryside beyond St Mary Cray.

These railway lines were already important as wildlife corridors in the late 1940s, and were probably the routes taken by such butterflies as the white admiral, silver-washed fritillary, gatekeeper and perhaps the grayling, all of which colonized or attempted to colonize Elmstead Wood and Sundridge Park during the long, hot summer of 1947.

As will have been seen from the preceding systematic lists, the species diversity in the 1940s was good for an area so close to central London and may still be so. It would certainly repay regular visits by local naturalists. Without intensive searching I was able to record 210 species of higher plants while failing to write down in my field notebook at the time a number of likely common species which I probably saw. Those I did note included such choice species for a locality so close to St Paul's Cathedral as bee orchid, common spotted orchid, musk mallow, common stork's bill, grass vetchling, yellow pimpernel, common century, deadly nightshade, orange hawkweed, common Solomon's seal, butcher's broom and common star-of-Bethlehem.

With eighteen species, including water shrew, red squirrel (one in 1942), fox, weasel and badger, the mammals were well represented. Reptiles included the common lizard and grass snake.

For an inland area, the bird life was also good and my friends and I recorded 82 species, 55 of which were known or thought to have bred, most of them annually. It was a stronghold of the elusive hawfinch in Walpole Bond's day at the turn of the century and remained so in the 1940s. Although not recorded since, this splendid bird is easily overlooked, and may still occur there. Grey partridge, woodcock, turtle dove, little owl, lesser spotted woodpecker, tree pipit, nightingale, grasshopper warbler, wood warbler, red-backed shrike, redpoll and yellowhammer were also noteworthy species present in the 1940s.

In four visits to Elmstead Wood between 4 May and 13 July 1986 inclusive, on behalf of the LNHS woodland breeding bird survey (Palmer 1988), L.R. Pierce recorded 26 species present and apparently breeding, judging by their behaviour, such as singing and holding territory. This compares unfavourably with the 46 species I considered to be breeding more or less regularly in the wood in the 1940s, a total which would have put it among the top dozen woods in Table 11 of Palmer's list of those within 20 miles (32.2 km) of St Paul's Cathedral which held 40 or more breeding species. It may also be compared, favourably, with the woodlands on Shooters Hill, 5 km to the north-east, which held 40 breeding species during the period 1943 to 1958 (Burton 1992). Two species appeared on Pierce's list which I did not consider to be breeding in Elmstead Wood in the 1940s: the magpie and the redpoll. Redpolls were breeding on nearby Chislehurst Common in the 1940s and were showing signs of increasing and spreading to neighbouring areas, while magpies were still recovering from earlier persecution by game preservers and did not recolonize Elmstead Wood and Sundridge Park until the 1950s. Not surprisingly in view of its greater variety of habitats, 55 species of birds bred, or probably did so, in Sundridge Park during the period under review.

Of those breeding birds which appear to have vanished from the area, the tree pipit and wood warbler are particularly interesting cases, and were targeted by Palmer's LNHS survey. He concluded from the results that neither species has shown a significant decline since the LNHS breeding bird atlas (Montier 1977), nor any evidence of 'a shift in the centre of gravity of the London population away from the centre', and that they are 'both holding their own'. From Pierce's brief description in his survey form of the habitats in Elmstead Wood in 1986 there would appear to have been little change since the late 1940s, with plenty of sites still with the scant undergrowth favoured by wood warblers for breeding, but until I am able to revisit the area I cannot be sure of this. For the same reason, I cannot know, therefore, if the former breeding sites of tree pipits in Elmstead Wood and Sundridge Park have become unfavourable to them, but I note from the *London Bird Report* that they also seem to have disappeared from Hayes and Keston Commons, where several pairs used to breed in the 1940s. It is possible that in all these localities the growth of birch and scrub has adversely affected their former breeding habitat. Several pairs of wood warblers also used to nest on Hayes and Keston Commons, and in Petts Wood in the 1940s, and I see from Palmer's (1988) report that up to six pairs were present at Hayes and Keston in 1985–7, and up to three pairs at Petts Wood. Without other evidence, I find it difficult to escape the conclusion that, unless they are being overlooked there, the encirclement of Elmstead Wood and Sundridge Park by dense urbanization is the chief reason for the current avoidance of the area by breeding tree pipits and wood warblers.

I found Elmstead Wood and Sundridge Park to be rewarding localities for the entomologist, and they may still be worth the attention of present-day investigators. My friends and I gave most of our attention to the butterflies, and between us recorded 28 species there in the 1940s. The moths included the now very rare four-spotted *Tyta luctuosa*, a *Red Data Book* Category 3 species (Shirt 1987).

The whole area was certainly worth conserving in the 1940s and this may still be the case today. I believe the London Wildlife Trust has been making efforts in that direction, especially where the bats are concerned, and, judging by remarks in the Nature Conservancy Council's booklet *On course conservation* (1989), the Sundridge Park Golf Club is sympathetic to nature conservation, and has done a great deal to protect the bats inhabiting its ice house.

Acknowledgements

As on previous occasions, I am most grateful to my friends Mr K.H. Hyatt and Dr D.F. Owen for supplying me with their data (the latter allowed me to extract information from the fascinating journal he kept in the 1940s), and for their enjoyable companionship on many visits to Elmstead Wood, Sundridge Park and elsewhere from our schooldays onwards. I am also grateful to another friend of youthful days, Mr K.H. Palmer, for sending me a photocopy of the questionnaire completed for his LHNS woodland breeding birds survey by Mr L.R. Pierce. Mrs Ann Sylph and Mrs Kate Ferguson, librarians at the Zoological Society of London, have been very helpful in tracking down and sending me photocopies of obscure papers from around a century ago. Gratitude is also due to Mrs Pat Argent of Sundridge Park Golf Club who kindly answered my questions and sent me a copy of the Club's handbook (Moor 1988). Finally, I must express my heartfelt thanks to Frau Wega Schmidt-Thomée for typing my handwritten manuscript so carefully.

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Benthic microcrustacean communities in four streams of the Ashdown Forest, south-east England

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Summary

Microcrustacea were collected in four streams, with contrasting pH, of the Ashdown Forest, south-east England. Samples were taken over four seasons. Comparison of the cladoceran communities with those of rivers in the London area showed similarities in species richness and composition. Persistence in the microcrustacean communities of the four streams exhibited a different pattern from that found in the macroinvertebrate communities. Clear differences in the abundance of microcrustacean groups were observed between streams with cyclopoid copepods domination harpacticoid copepods in the two acid streams. Many microcrustacean groups and species had a distinct seasonality and for some, the timing of density maxima also varied between streams.

Introduction

The benthos of streams and rivers includes a taxa of small Crustacea between 0.25–2 mm in length, commonly called the Microcrustacea. They comprise species of Cladocera, cyclopoid and harpacticoid copepods and Ostracoda. In fresh waters they have been found in almost every environment including lakes, ponds, groundwaters, cave systems, moss seeps, streams and rivers (e.g. Dumont 1987, Sabater 1987, Fryer 1993).

The ecology of benthic Microcrustacea in ponds and lakes is well known (e.g. Williams 1982, Strayer and Likens 1986, Van de Bund, Davids and Spaas in press). In contrast, much less is known of this group in running waters. Within the last decade, however, there has been increasing interest, Most benthic Microcrustacea are primary consumers that feed on microalgae, bacteria, fungi, protozoa and detritus. They are extremely efficient at assimilating detrital microbes, much more efficient than some detritivorous macroinvertebrates (Perlmutter and Meyer 1991). Lotic benthic Microcrustacea may also be important prey items for young fish (e.g., Rundle and Hildrew 1992) and for some predatory invertebrates (Lancaster and Robertson 1995). Organic detritus is the primary energy base of many running waters and Microcrustacea may play an important role in the energy flow of lotic systems by virtue of their high abundance and production (Robertson 1990, in press), assimilation efficiency and prey potential. Additionally, Microcrustacea, unlike many macroinvertebrates, remain in the aquatic habitat throughout their life cycle and thus may be more closely linked to the dynamics of this environment.

Further information on their ecology is, therefore, desirable. There have been studies on their seasonal population dynamics (Robertson 1990*b*, Rundle 1993), their distribution in relation to environmental variables (Rundle and Hildrew 1990, Rundle and Ormerod 1991) and their response to physical disturbance (Palmer, Bely and Berg 1992, Robertson, Lancaster and Hildrew 1995). However, information on seasonal and between-stream variation in benthic microcrustacean communities is still limited and, in particular, the persistence of communities over time has been little studied in streams. Much of the work outlined above has been done on the streams and rivers of south-east England, mainly in the Ashdown Forest, and in this study I build on this background.

I report on the benthic microcrustacean communities of four streams in the Ashdown Forest with the aims of:

1. Examining between stream and between season variation in microcrustacean community composition.

2 Relating the results obtained in this study to those of an earlier study on the same streams in order to study community persistence.

3 Comparing the microcrustacean communities in these Ashdown Forest streams with those of other running waters in the London area.

Site description

The four streams are among the headwaters of the River Medway and the Sussex Ouse in south-east England (Figure 1), and are found in the Ashdown Forest, which is the watershed between the tributaries of these two rivers. The underlying geology of this area is base poor and the soils are thin, leached and acid. Townsend, Hildrew and Francis (1983) give a full description of the land use, geology and vegetation of the area.

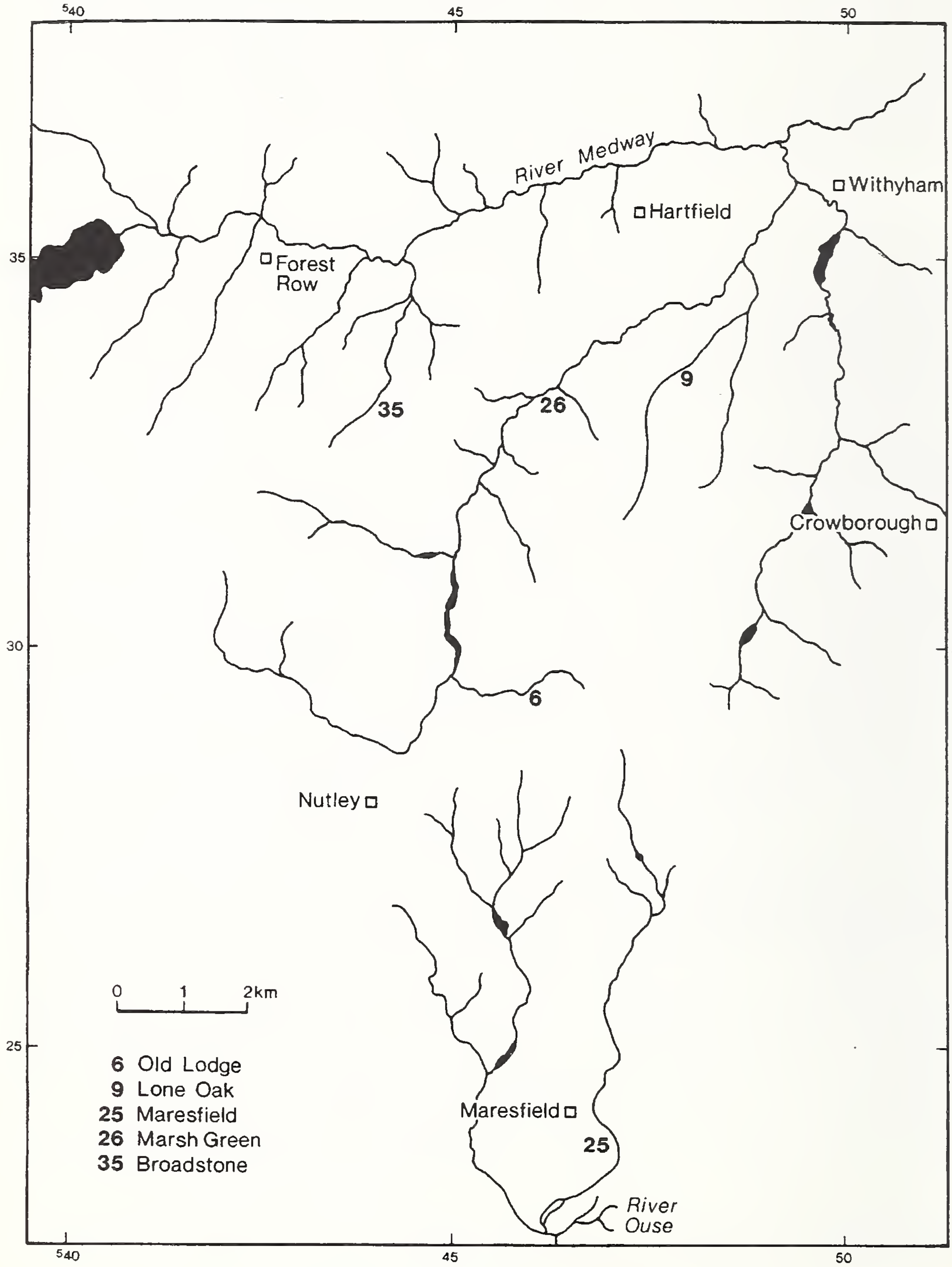

FIGURE 1. Location of four stream sites in the catchments of the Rivers Medway and Ouse, Ashdown Forest.

The four streams are part of a much larger network of sites in this area which gave been extensively surveyed for Microcrustacea (Rundle 1990, Rundle and Hildrew 1990) and macroinvertebrates (Townsend et al. 1983).

They are		
	Old Lodge (6)	TQ456294
	Broadstone (35)	TQ439333
	Maresfield (25)	TQ468241
	Marsh Green (26)	TQ461332

The numbers in parentheses correspond to the numbers used for these sites in the surveys of Townsend et al. (1983), Rundle (1990) and Rundle and Hildrew (1990). All are tributaries of the River Medway with the exception of Maresfield which drains into the Sussex Ouse (Figure 1). The physicochemistry of the four streams has been well documented by, among others, Groom (1987), Rundle and Hildrew (1990) and Lancaster and Hildrew (1993). Key points are noted in Table 1.

TABLE 1. Physicochemical variables from four streams in the Ashdown Forest (data from Groom 1987, Rundle and Hildrew 1990, Lancaster and Hildrew 1993).

Stream	pH range	Ca mg l^{-1}	Conductivity(µS cm^{-1} 25°C)	Mean temperature (°C)	Mean width (m)	Mean depth (cm)	Discharge(m^3 .s^{-1}) Mean daily Min.	Max.	Distance from source (km)
Old Lodge	4.1–4.7	3.3	80	8.2	2.26	16.16	0.007	0.04	1.72
Broadstone	4.6–5.7	8.5	85	8.6	1.38	14.22	0.001	0.11	0.42
Maresfield	6.1–6.7	22.3	175	9.1	2.42	17.80	0.017	0.33	5.29
Marsh Green	6.0–6.8	11.4	125	9.3	3.65	23.05	0.033	0.39	9.54

The streams can be divided into two distinct groups on the basis of their physicochemistry (Table 1). The first group consists of Broadstone and Old Lodge, small first-order streams draining acidic heath and some mixed woodland. They are acidic (pH range 4.1–5.7), with low values of calcium (3.3–8.5 mg l^{-1}) and conductivity (80–85µS cm^{-1}). Discharge is also low (Table 1) and the sampling sites are relatively close to the stream source. In contrast, streams in the second group, (Maresfield and Marsh Green), are larger and second order, flowing through mixed woodland and agricultural lands. They are circumneutral (pH range 6.0 – 6.8), with higher values of calcium (11.4–22.3 mg l^{-1}) and conductivity (125–175 µS cm^{-1}). Discharge is higher in this group (Table 1) and the sampling sites are more distant from the stream source.

Methods

Five Surber samples (area 0.1 m^2, mesh size 80 µm) were taken at random from each site in February (winter), April (spring), June (summer) and September (autumn) in 1992. Samples were preserved in the field in 4 per cent formaldehyde. In the laboratory, Microcrustacea were sorted from inorganic and organic material, identified to species and counted (with the exception of Ostracoda which were only counted). Differences in the abundance of microcrustacean groups and species between sites and also between dates within sites were assessed using nested ANOVAS. Abundance data were ln(x+1) transformed before analysis.

Results

All four microcrustacean groups (Cladocera, cyclopoid and harpacticoid copepods and Ostracoda) were represented in each of the four streams. In total 26 species were identified (9 species of chydorid and 1 species of macrothricid Cladocera, 6 species of cyclopoid and

TABLE 2. Microcrustacean species found in seasonal samples taken from four streams in the Ashdown Forest. + indicates species presence (P) in a stream. x shows species presence in Winter (W), Sp (Spring), Su (Summer) and A (Autumn) samples.

	Broadstone					**Old Lodge**					**Maresfield**					**Marsh Green**				
	P	W	Sp	Su	A	P	W	Sp	Su	A	P	W	Sp	Su	A	P	W	Sp	Su	A
Chydoridae																				
Monospilus dispar Sars																+				x
Pleuroxus uncinatus Baird																+				x
Acroperus harpae Baird											+				x					
Chydorus sphaericus (O.F.Müller)						+	x	x	x	x	+				x	+	x	x	x	x
Alona quadrangularis (O.F.Müller)	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x
Aona rectangula Sars						+				x						+				x
Alona rustica Scott	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x
Alonella nana (Baird)						+	x	x	x	x						+	x	x	x	x
Disparalona rostrata (Koch)																+	x		x	x
Macrothricidae																				
Iliocryptus acutifrons																+	x	x		
Cyclopoida																				
Paracyclops affinis (Sars)											+	x	x	x		+	x	x	x	x
Paracyclops fimbriatus (Fischer)	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x
Acanthocyclops vernalis (Fischer)	+	x	x	x	x	+	x	x	x	x	+	x	x	x		+	x	x	x	
Diacyclops languidus Sars	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x
Diacyclops languidoides Lilljeborg	+	x		x	x						+			x						
Eucyclops serrulatus Fischer	+	x		x	x	+	x	x	x	x	+	x	x	x		+	x	x	x	x
Harpacticoida																				
Moraria varica (Graeter)											+		x	x		+		x	x	
Moraria brevipes (Sars)	+	x	x	x	x	+	x	x	x	x	+	x	x	x		+	x	x	x	
Atheyella crassa Sars	+	x	x	x	x	+				x	+	x	x	x	x	+	x	x	x	x
Canthocamptus staphylinus (Jurine)											+	x	x	x	x	+	x	x	x	x
Bryocamptus zschokkei (Schmeil)	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x	+	x	x	x	x
Bryocamptus pygmaeus Sars	+	x	x	x	x	+	x				+	x	x	x		+	x	x	x	
Bryocamptus echinatus (Mrazek)						+	x	x			+	x			x	+	x	x	x	x
Bryocamptus weberi (Kessler)											+	x	x	x	x	+	x	x	x	
Bryocamptus minutus (Claus)											+	x	x	x	x	+	x	x	x	x
Bryocamptus cuspidatus (Schmeil)																+			x	
Ostracoda	+	x	x	x	x	+				x	+	x	x	x	x	+	x	x	x	x

10 species of harpacticoid Copepoda) (Table 2). Ten species were found in all four streams, however a further 8 species were only found in Maresfield and Marsh Green streams, which are circumneutral. These two streams had a higher microcrustacean species richness (19 and 24 species respectively) than the acidic Old Lodge and Broadstone streams (14 and 11 species respectively).

The percentage of the species pool collected in each season varied between streams and was rarely 100 per cent. In the circumneutral Maresfield and Marsh Green streams, the lowest proportion of the species pool was collected in autumn (63 per cent and 71 per cent respectively) and the highest in summer (Table 2). In the acidic Broadstone and Old Lodge streams, however, the proportion of the total species pool collected was more constant, with low points in spring and summer respectively (Table 2).

Rundle (1990) studied Microcrustacea in the same four Ashdown Forest streams in 1986 and community persistence over the six years separating the two studies can be estimated

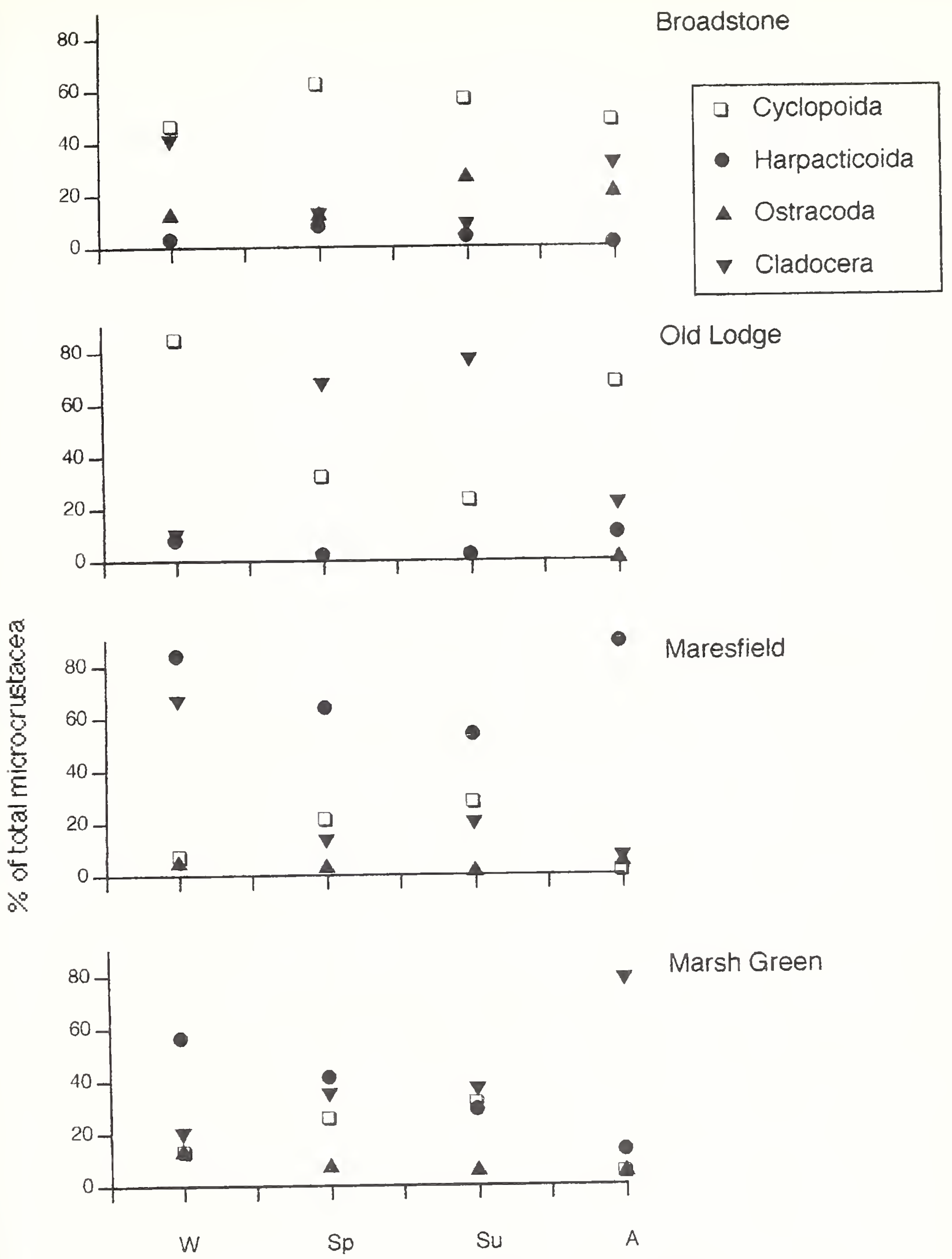

FIGURE 2. Seasonal variation in the proportions of four microcrustacean groups in four streams in the Ashdown Forest.

TABLE 3. Persistence of the microcrustacean community (measured as percentage of total species pool common to Rundle (1990) and present study) in four streams in the Ashdown Forest over a six-year period.

	Old Lodge	Broadstone	Maresfield	Marsh Green
Chydoridae	16%	100%	40%	18%
Cyclopoida	57%	83%	50%	50%
Harpacticoida	40%	80%	71%	54%
Total Microcrustacea	39%	85%	55%	40%

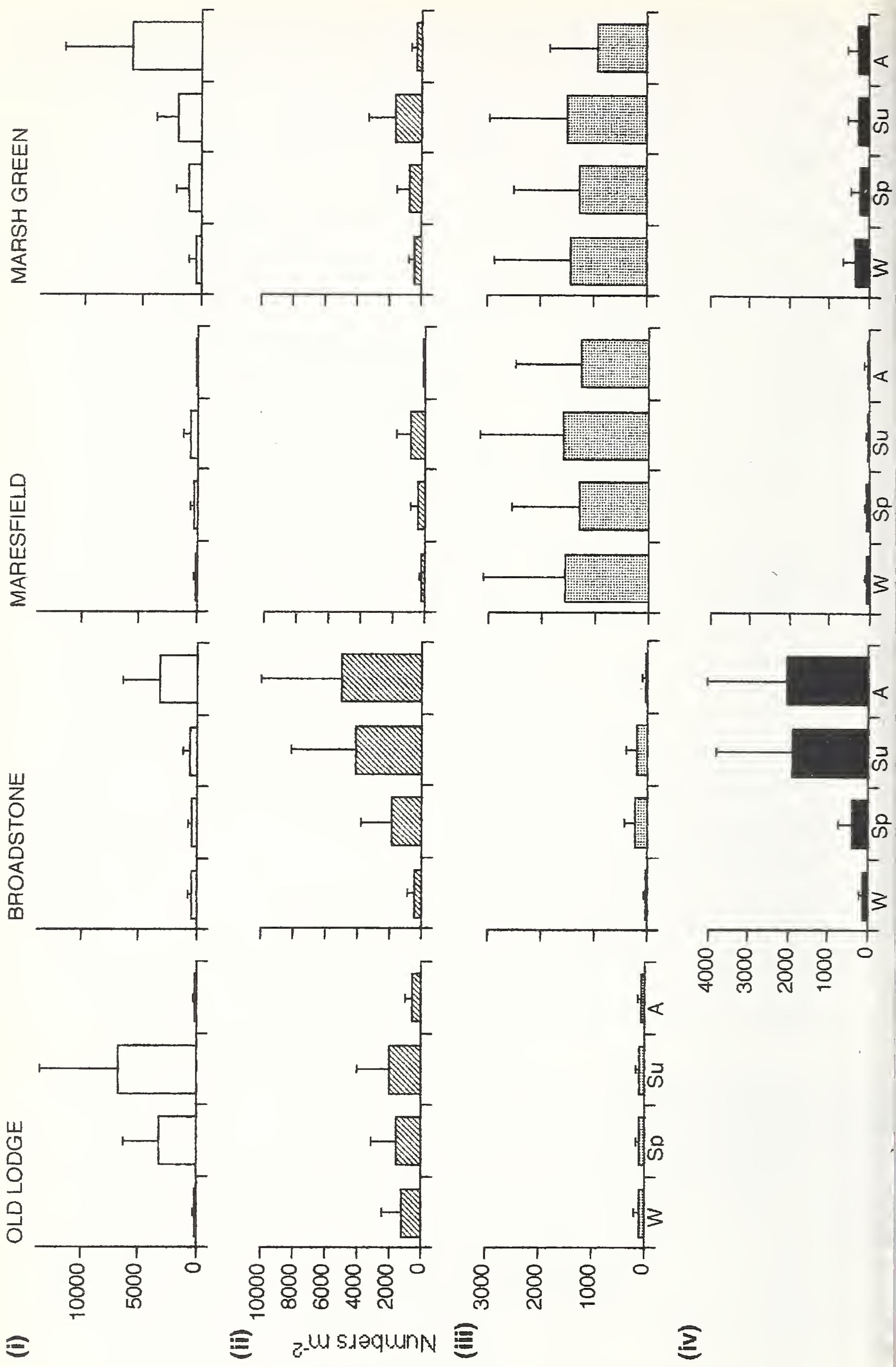

FIGURE 3. Density (mean + 1 S. E.) of (i) total Chydoridae, (ii) total Cyclopoidae, (iii) total Harpacticoida and (iv) Ostracoda at four seasons (W, winter, Sp., spring, Su., summer and A, autumn) in four streams in the Ashdown Forest.

by expressing the species common to both sampling occasions as a percentage of the total species pool from both studies (Table 3). Persistence varied among microcrustacean groups and over the four streams. Chydoridae had the lowest persistence of all groups (except in Broadstone stream). Overall persistence in the microcrustacean community was highest in Broadstone although there was an overall decline in species richness (from 14–11 species) between the two sampling dates. Persistence was lower in the remaining three streams (declining in the order Maresfield, Marsh Green, Old Lodge). Overall species richness, however, increased and was mainly due to an influx of chydorid and harpacticoid species.

Cyclopoid copepods numerically dominated harpacticoid copepods in Old Lodge and Broadstone streams, accounting for 32–84 per cent of total microcrustacean numbers (Figure 2). In Maresfield and Marsh Green streams, cyclopoid copepods accounted for only 1–31 per cent to total numbers and were co-dominant with or dominated by harpacticoid copepods (Figure 2). In three out of four streams ostracods were low in abundance and accounted for only a small proportion of total numbers. However, in Broadstone stream they were numerous and accounted for a maximum of 26 per cent of total numbers (Figure 2). Cladocerans were most abundant in Marsh Green and Old Lodge streams, in the latter they formed the majority of the total microcrustacean population in spring and summer (Figure 2).

TABLE 4. Mean annual abundance (+1 SE) of four microcrustacean groups and total microcrustaceans in four streams in the Ashdown Forest. F values from nested ANOVAS comparing abundance between sites and between dates within sites are given (*p<0.05, **p<0.01, ***p<0.001).

	Site (N)				F value	
	Broadstone	**Old Lodge**	**Maresfield**	**Marsh Green**	**Site**	**Date (site)**
Harpacticoida	116 (231)	78 (62)	1410(987)	1261 (800)	39.5***	0.47
Cyclopoida	2825 (4271)	1307 (1625)	355 (676)	761 (1359)	3.4*	2.0*
Cladocera	1137 (2598)	2557 (5112)	256 (393)	2363 (2785)	6.8***	3.5***
Ostracoda	1096 (2060)	0.5 (2.2)	54 (29)	272 (253)	24.2***	1.6
Total	5348 (8042)	3872 (6288)	2081 (1219)	4670 (3696)		

Microcrustacea were most abundant in the acidic Broadstone stream (Table 4). All taxonomic groups showed a significant difference in their abundance between sites (Table 4, Figure 3). The abundance of total Chydoridae and Cyclopoida also varied significantly between dates within sites (Table 4). The timing of peak densities for a group varied between streams. In Old Lodge and Maresfield total Chydoridae peaked in summer whereas in Broadstone and Marsh Green density maxima occurred in autumn (Figure 3). In Broadstone stream total Cyclopoida peaked in autumn, in the remaining three streams density maxima occurred in summer (Figure 3).

Chydoridae are very abundant in two streams (Old Lodge and Marsh Green), and here two species, *Chydorus sphaericus* and *Alona quadrangularis*, dominate. In Old Lodge total Chydoridae density peaks in summer and is comprised mainly of *Chydorus sphaericus*. In Marsh Green, however, total Chydoridae density peaks in autumn and consists largely of *Alona quadrangularis* (Figure 4).

The timing of peak densities of *Alona quadrangularis* and *Paracyclops fimbriatus* (a cyclopoid copepod) followed the same trends shown by their higher taxonomic groups in the four streams (Figures 3 and 4). Their densities also varied significantly between sites (nested ANOVA, *A. quadrangularis* F = 17.8, p<0.001; *P. fimbriatus* F = 4.5, p<0.01) and between dates within sites (nested ANOVA, *A. quadrangularis* F = 2.5, p<0.05; *P. fimbriatus* F = 2.3, p<0.01).

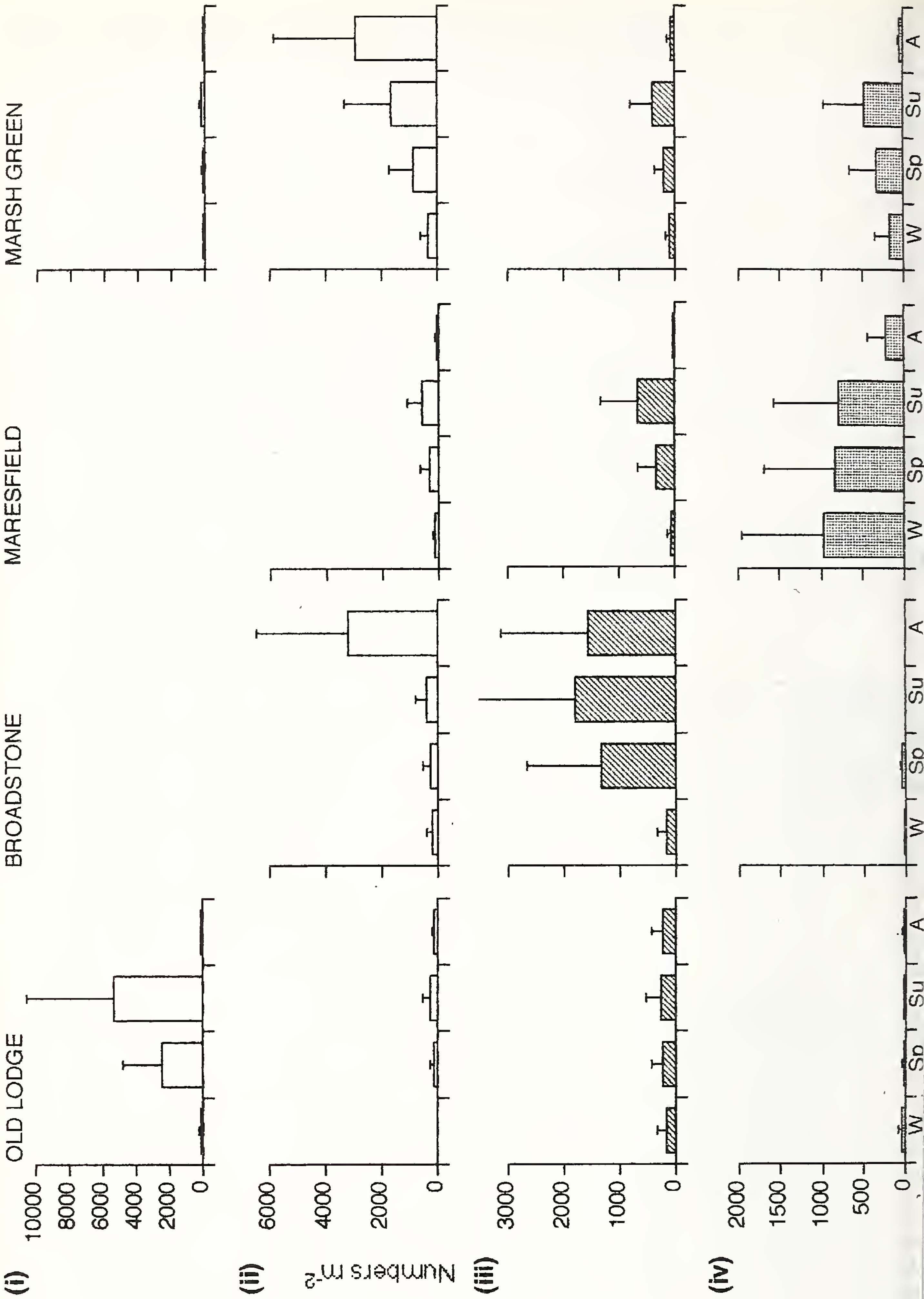

FIGURE 4. Density (mean + 1 S. E.) of (i) *Chydorus sphaericus*, (ii) *Alona quadrangularis*, (iii) *Paracyclops fimbriatus* and (iv) *Bryocamptus zschokkei* at four seasons (W, winter, Sp., spring Su., summer and A, autumn) in four streams in the Ashdown Forest.

In contrast to total Harpacticoida, dynasties of *Byocamptus zschokkei* (a harpacticoid copepod) are significantly different between dates within sites (F = 5.54, p<0.001) as well as between sites (F= 91.8, p<0.001). Timing of peak densities in the four streams for this species do not clearly follow those of total Harpacticoida (Figures 3 and 4).

Discussion

The study of microcrustacean communities in flowing fresh waters is in its infancy and ittle data are available for comparison with that for the Ashdown Forest streams. In south-east England Robertson (1990) provides the only detailed examination of a microcrustacean group in flowing waters. She focused on benthic cladocerans in the unvegetated mud habitat of a large river (River Thames, London) but also sampled the same habitat and group in a number of smaller rivers, many of which are also in the London area. Table 5 shows the benthic cladocerans found in these rivers together with those from the four streams in the Ashdown Forest of the present study.

Chydoridae show an unambiguous preference for large lakes and are relatively rare in small ponds (Fryer 1985). This relationship, however, may not hold in flowing waters, the Ashdown Forest streams are smaller and lower order than the rivers in Table 5, but their cladoceran species richness is within the range shown by the larger rivers. Within a given catchment,a small stream and the large river it eventually drains into are continuous. It can be argued that they are the same 'size' with respect to continuous habitat. Restrictions on cladoceran species diversity in ponds resulting from some factor(s) associated with the small size of the water body may, therefore, not apply to small streams. Perhaps for flowing waters the appropriate question, therefore, is not 'do large rivers and small streams differ in their crustacean species richness?', but 'do catchments of different sizes containing larger or smaller overall lengths of flowing waters differ in their crustacean species richness?'

The macroecology of the rivers of the London area and the Ashdown Forest streams is rather different. The former are larger water bodies and tend to have a smaller particle size (see Table 5) than that of the Ashdown Forest streams. Despite these differences many of the same cladoceran species were found in both environments and some were members of the littoral benthic taxocene of cladocerans identified by Robertson (1990*a*). This comprises cladoceran species characteristically found in the benthos of the unvegetated littoral of lakes and rivers and consists of *Iliocryptus sordidus*, *Alona affinis*, *A. quadrangularis*, *A. rectangula*, *Disparalona rostrata*, *Chydorus sphaericus* and *Leydigia leydigi*. Many members of the taxocene are well known inhabitants of the sediments; *Alona affinis* associates preferentially with the substrate whereas *Leydigia leydigia* and *Iliocryptus sordidus* are truly benthic species and possess a number of relevant adaptations (Fryer 1968). In a study of the palaeolimnology of Grane Langso, Whiteside (1970) noted that *Chydorus sphaericus*, *Alona affinis*, *A. quadrangularis* and *A. rectangula* were true pioneer species, occurring very early in the history of the lake at a time when macrophytes were probably absent. Species belonging to the littoral benthic taxocene are not confined to this habitat and are frequently abundant in others, *Chydorus sphaericus* and *Alona rectangula*, for example, are also found in the vegetated littoral and the limnetic regions of lakes.

One species found in both the London rivers and the Ashdown Forest streams was *Alona quadrangularis*, this relatively large species (approximately 1 mm long) was found in eight of the fourteen streams/rivers in Table 5. This species has been classified as rheophilic (Dumont 1987) and is said to be predominantly an inhabitant of alkaline waters although it also occurs in acid environments (Fryer 1993). This pattern is followed in the present study where *A. quadrangularis* is found in both neutral and acidic rivers and streams. The distribution of some cladoceran species may be limited by their lack of tolerance to acidic pH. *Disparalona rostrata* and *Pleuroxus uncinatus* occur only in circumneutral rivers and streams in Table 5. In Yorkshire they have been found only in water bodies with pH 6.8 or higher (Fryer 1993), and on Wimbledon Common, London *D. rostrata* was not found below pH 6.6 (Robertson 1990).

TABLE 5. Benthic cladocerans in the unvegetated mud of some rivers and streams in London and the South-East.

	River Thames TQ 172734	River Chess TQ 064955	River Crane TQ 101771 TQ 132728 TQ 154756	River Cray TQ 497735	River Darent TQ 546670 TQ542656	River Lee TL276098 TL 220124	River Roding TQ 467969 TQ508975	River Wey TQ 070613	River Cuckmere TQ 582122	River Limden TQ 707277	Marsh Green TQ 461332	Maresfield TQ 468241	Old Lodge TQ 456294	Broadstone TQ 439333
	Depth variable. Fine mud.	Depth 70 cm Swift flow. Mud to fine gravel.	Slowflow Clay and gravel with mud.	Depth 80 cm Medium flow. Silt.	Depth 12 cm Swift flow. Pebbles and mud.	Depth 1 m Mud, sand and gravel.	Depth 30 cm Medium flow. Mud and gravel.	Depth 20cm Fast flow. Sand and gravel.	Depth 30 cm Swift flow. Gravel and stones.	Depth 1 m Slow flow. Fine gravel and mud.	Depth 23 cm Medium flow. Stony.	Depth 18 cm Medium flow. Stony.	Depth 16 cm Slow flow. Stones and mud.	Depth14 cm Slow flow. Stones, mud and detritus.
Species														
Alona affinis	x	x			x	x		x	x					
A. quadrangularis	x	x			x					x	x	x	x	x
A. rectangula	x	x	x				x				x		x	
A. guttata								x						
A. rustica											x	x	x	x
Chydorus sphaericus		x								x	x	x		
Acroperus harpae			x									x		
Disparalona rostrata	x	x		x	x					x	x			
Leydigia leydigi	x		x	x	x									
Monospilus dispar										x	x			
Eurycercus lamellatus		x												
Pleuroxus uncinatus	x				x		x				x			
P. trigonellus	x		x				x							
Alonella nana											x		x	
Iliocryptus sordidus	x	x	x	x		x	x							
I. acutifrons											x			
Macrothrix laticornis	x													
Species richness	nine	four	seven	two	five	four	four	two	one	one	nine	four	five	two

Rundle (1990) studied the same four Ashdown Forest streams in 1986 and a comparison of microcrustacean community structure found in the two studies reveals both similarities and differences. In both studies species richness of the two circumneutral streams was higher than those of the acidic streams. The phenomenon of decreasing crustacean species diversity with decreasing pH is well known (Fryer 1980) and has also been shown by Rundle and Hildrew (1990) and Robertson (1990*a*).

There were differences, however, in the species richness seasonality between the two studies. In 1986 species richness peaked in autumn in circumneutral sites and in summer at acidic sites. In contrast, this study found species richness was lowest in autumn at circumneutral sites (Maresfield and Marsh Green) and highest in summer. The present study, however, concurs with the observation of Rundle (1990) that acid sites had very similar species compositions throughout most of the year whereas circumneutral sites exhibited greater variation.

The data on persistence in the community over a six-year period are among the first presented for stream Microcrustacea, and so data for comparison are limited. There is information, however, available on the persistence of stream macroinvertebrate communities in the Ashdown Forest. Townsend, Hildrew and Schofield (1987) found persistence in these communities was greatest at low discharge, upstream sites with low stable pH. Both Broadstone and Old Lodge streams fit his category: the former has the highest microcrustacean community persistence and the latter stream has the lowest. Thus factors affecting microcrustacean and macroinvertebrate community persistence must differ to some extent.

Clear differences in abundance of the microcrustacean groups were observed between streams in this study. Cyclopoid copepods numerically dominated harpacticoids in the two acid streams while the reverse tended to be true in the circumneutral streams. This corroborates the observations of Rundle (1990:93) who found similar patterns both in the Ashdown Forest and in mid Wales. Cyclopoid copepods are mainly epibenthic in habit and are weak swimmers (Palmer et al. 1992). Both Broadstone and Old Lodge are highly retentive streams, effectively retaining leaf litter and other organic debris (Groom and Hildrew 1989), maximum discharge is low and suitable habitat for these Microcrustacea may be more abundant and may occur more persistently in these acid streams. Robertson et al. (1995) found cyclopoid copepod densities were higher in a reach of Broadstone Stream characterized by low mean-reach velocity.

Harpacticoid copepods tended to dominate cyclopoid copepods in the two circumneutral streams. Rundle and Hildrew (1990) found that harpacticoid densities showed significant positive correlations with mean stream pH and temperature. They suggested that the relationship with temperature may result from the decline in development times of harpacticoids with increasing temperature (Sarvala 1979, O'Doherty 1985). However, this trend is also exhibited by other microcrustacean groups (Sarvala 1979, Robertson 1988, Delorme 1991), including cyclopoid copepods whose densities do not increase in warmer streams. The two most common hapacticoid taxa *Atheyella crassa* and *Bryocamptus zschokkei* are found over a wide range of pH in the Ashdown Forest (present study; Rundle and Hildrew 1990) and in other areas (Fryer 1993). I speculate that their increased abundance in Maresfield and Marsh Green may, in part, relate to the hydraulic conditions found in these streams. Harpacticoid species are interstitial in habit and may thus be sensitive to levels of interstitial oxygen. In Maresfield and Marsh Green where maximum discharge and flow of water through the interstitial habitat is relatively high, interstitial oxygen may not be limiting. However, in the two acid streams, maximum discharge and the flow through the interstitial habitat is lower, interstitial oxygen may be limiting and may result in lower densities of interstitial harpacticoids.

Chydorid cladocerans were particularly abundant in Old Lodge and Marsh Green streams which possess many large, deep pools. Like the cyclopoid copepods chydorid cladocerans are epibenthic in habit, they are weak swimmers and are easily washed out of the stream habitat (Richardson 1992). However, chydorid cladocerans reproduce by parthenogenesis in favourable conditions and generation times are shorter than those of the Copepoda (Sarvala

1979, Robertson, 1988). During the summer, chydorid densities increased very rapidly in the favourable conditions offered by the slow-flowing pools of Old Lodge and Marsh Green.

Many microcrustacean group and species densities had a distinct seasonality and peaked in summer or autumn. These findings corroborate those of Rundle (1990: 93) who observed marked seasonality in microcrustacean groups in the Ashdown Forest and mid Wales. Robertson (1990*b*) also found that benthic Chydoridae in the River Thames showed a distinct summer peak in abundance. The reproductive rates of all microcrustacean groups are temperature dependent and this, allied to the low summer discharges of many streams (meaning fewer individuals are washed downstream), makes it unsurprising that density maxima should occur in summer and autumn. Low winter and spring densities result from a combination of higher stream discharges (more individuals washed downstream) and lower reproductive rates due to lower temperatures.

In 1992 the timing of density maxima for some microcrustacean groups and species varied between streams although there was no clear relationship with pH. One such group was the Chydoridae where density maxima occurred in summer in Old Lodge and in autumn in Broadstone and Marsh Green. Inspection of chydorid species densities indicated that *Alona quadrangularis* (density maximum autumn) was the main constituent of the total Chydoridae autumn peak in Marsh Green and Broadstone. *Chydorus sphaericus* (density maxima summer) formed the majority of the total Chydoridae peak in Old Lodge. In contrast, Rundle and Hildrew (1990) found no differences in the timing of density maxima between streams. The dramatic summer peak in total Cyclopoida noted by Rundle and Hildrew (1990) in the acid streams of the Ashdown Forest in 1986 did not occur in 1992 although total Cyclopoida densities were clearly higher in acid streams than in neutral ones. Such differences over a six-year period highlight the limitations of community structure studies based on data collected in one season or year.

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Book review

Birds and climate change. John F. Burton. Christopher Helm / A & C Black, London 1995. 376 pp. £24.99. ISBN 0 7136 4045 6.

The author approaches this subject with a knowledge of ornithology and entomology and with an inspiration originating from the work of the late Kenneth Williamson. The strength of this book is in the data it contains which is the result of thirty years of fieldwork by the author and the collected wisdom contained in seven chapters of a draft book on this subject which was never completed due to the death of Ken Williamson in 1977.

The book contains 376 pages arranged in thirteen chapters within three sections. The first section paints a picture of the changing climate of Britain and Europe from the last ice age 10,000 years ago until 1950. Early faunal evidence from the fossil record and from analogous recent ecosystems gives way to the written record and modern census data. The second section takes the major groups of birds and analyses their changing fortunes during the climate improvement which occurred between 1850 and 1950. The third section deals with the period, from 1950 to the present and climatic deterioration which occurred during that time. The effect of that deterioration had been partially modified by the warming influence of the 'greenhouse effect'. The final chapter gives the reader a glimpse into the future; the book closes with a collection of excellent appendices and an exhaustive bibliography.

The reader cannot fail to be enlightened by this book; the sheer wealth of data and the very readable way it is presented must ensure its success. As expected, the main message is that climatic change is the principal influence on the distribution of our bird life. The strength of some of the arguments put forward to support this claim is compelling. However there are a number of instances where the associations are weak and the author admits to speculation. From a conservationist viewpoint this book can make depressing reading, for while it may be possible, with a great deal of effort to influence modern agricultural methods, to reduce the use of pesticides, to influence the destructive effects of overfishing and to curb the activities of egg collectors; it is impossible to control the climate here seen as the major factor affecting wildlife distribution. However, unlike the devastation caused by man, there is an upside to climatic change as it effects a redistribution of species with some birds declining and others increasing their range to reshape traditional ecosystems. This book gives the reader a greater overview of time-scale and geography so that impressions of very recent and local declines in certain common birds often turn out to be of longer term, widespread and of climatic origin, with mans' activities hastening their final demise.

In conclusion, I would suggest that all but the most superficial bird enthusiast will find this book absorbing reading. For the serious ornithologist it is an invaluable reference work and it has found a vacant niche in the 'literary ecosystem of knowledge' worth exploiting. My only criticism is of the poor quality of the few black-and-white photographs which contrast with the striking picture of a delightful black-winged stilt on its cover.

R. Francis

The tube-web spider *Atypus affinis* rediscovered on Hampstead Heath after more than a century

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> *'I started early in 1876 to search the banks at the sides of such lanes as remain around the north of ondon . . . . and on March 26th I finally dug up my precious find; an adult female* Atypus *from near he roots of the gorse bushes which proliferate on that part of Hampstead Heath.'* Fred Enock. *Transctions of the Entomological Society of London,* 1885, after *'searching all the lanes of North London rom Hendon to Hampstead'* in the summers of 1876 and 1877.
>
> *'The most remarkable spider recorded from the Hampstead area, and also the most interesting of British species is the Trap-Door Spider (*Atypus*).'* F. O'Brien Ellison (Hampstead Scientific Society 913).

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Abstract

An account is given of the rediscovery on Hampstead Heath after more than a century of the mygalomorph spider *Atypus affinis*. Details of the original discovery by F. Enock are given, as are some observations about the animals and plants found in the vicinity of the rediscovery. Some suggestions are made about the necessary management of the area if the species present are to be conserved.

Introduction

Atypus affinis Eichwald, 1830 (synonymous with *A. sulzeri* Blackwall, *A. blackwalli* E. Simon, and *A. piceus* O. P.-Cambridge) is one of Britain's most spectacular spiders. It is a fairly large reddish-brown hairy spider (15–20 mm), of very chunky build with short strong legs and extremely large and powerful jaws or chelicerae (Figure 1). Unlike those of all other British spiders these jaws move in the vertical rather than the horizontal plane. This is one of the features that result in it being included in the Orthognatha (Mygalomorphae), a suborder which includes trap-door spiders and the familiar tropical 'tarantula' of bird-eating fame. All other British species are included in the Labidognatha

(Araneomorphae), the suborder which includes orb-web spinners (such as Argiopidae), jumping spiders (Salticidae) and money spiders (Linyphiidae).

Known variously as the ' purse-web spider', the 'tube-web spider', and even erroneously as the 'trap-door spider' (Enock 1885), it is unique among spiders in Britain in spinning a web in the form of a tube, most of which is underground (Figure 2), and with an aerial 'catching' section loosely attached to the adjacent surface (Figure 3). It is found on heaths and in sandy places where it can construct its web without too much difficulty, in many parts of southern England, and there are also isolated colonies in the north of England and Scotland. It is widely distributed in Europe as far north as Denmark, as is the closely related *Atypus piceus* Sulzer, 1776 (Roberts 1995*b*).

Atypus on Hampstead Heath

All semi-natural habitats in the London area have been very strongly affected by human activities over thousands of years. Three particular factors, deforestation and other disturbance, eutrophication, and airborne pollution, have combined to make the area unsuitable for many species that occupied the area formerly. Some public open spaces, such as Oxleas Wood, have been maintained with something approaching their traditional management regimes, but Hampstead Heath has been subjected to major changes over the last hundred years or so, particularly in the past few decades, which have resulted in the loss of many species (and the area's colonizaton by many new ones).

Over the last hundred years or so several naturalists have made reference to the existence of *Atypus affinis* on Hampstead Heath, whilst the next nearest site to central London appears to be Wimbledon Common in Surrey (Dallas 1938). As the years went by the Hampstead record seemed to become more and more unlikely, at best a record from a halcyon time when it really was a heath, covered with heather *Calluna vulgaris* and bilberry *Vaccinium myrtillus,* and dotted with juniper *Juniperus communis* bushes. Like other species known

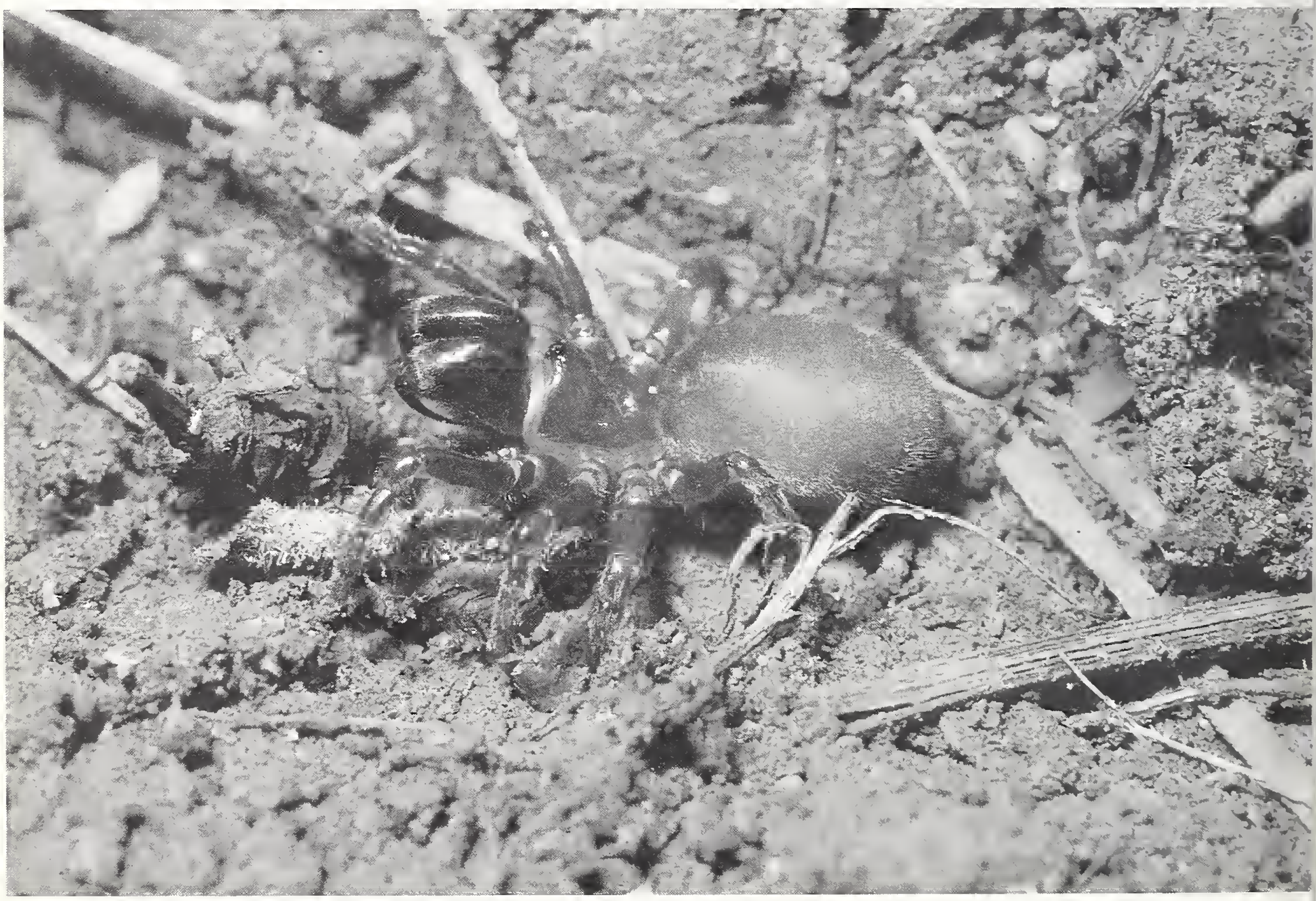

FIGURE 1. An adult female *Atypus* on a rare foray outside her tube-web. The enormous chelicerae ar unmistakable.

Photo: R.A. Preston-Mafham/Premaphotos Wildlife

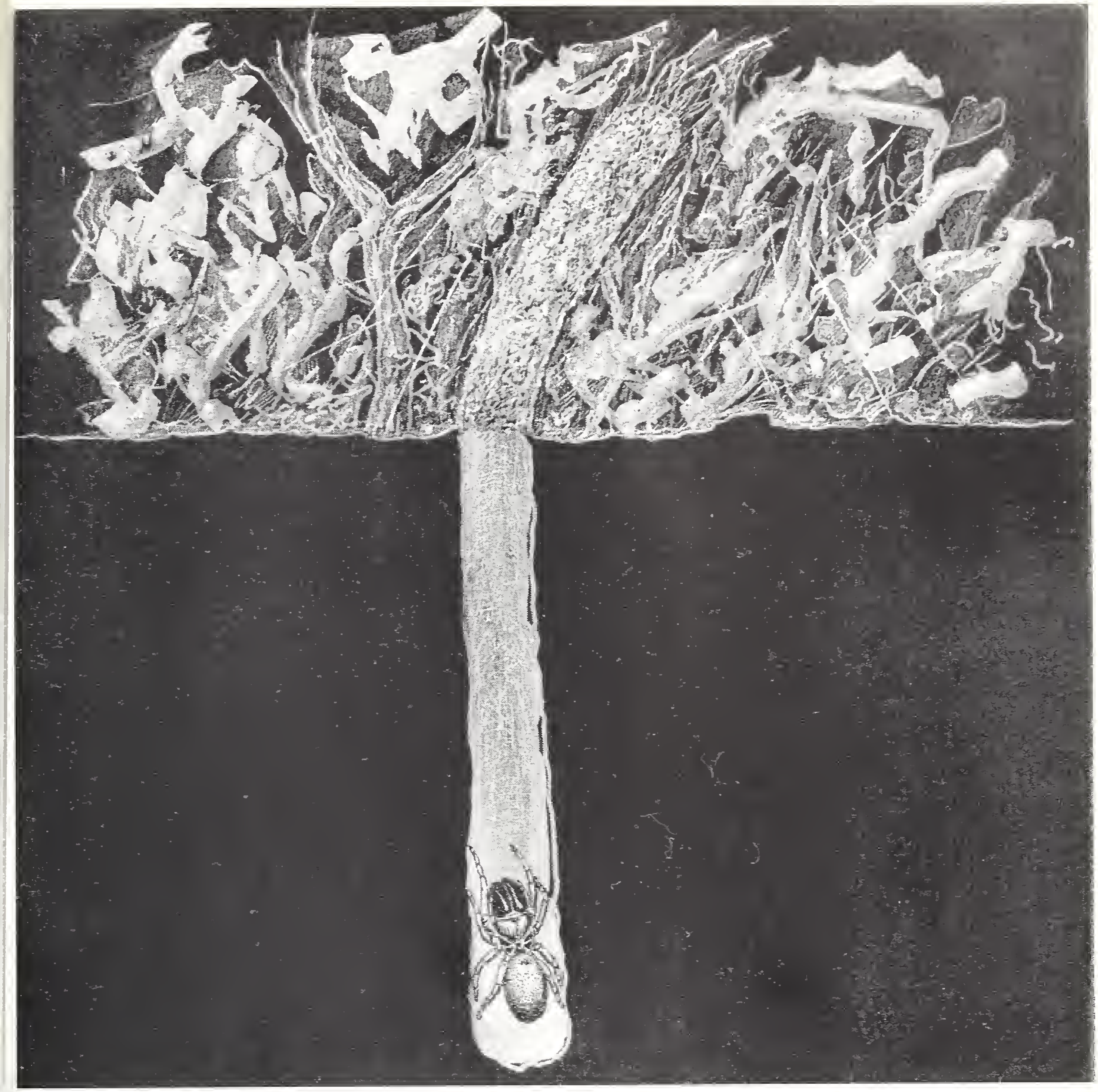

FIGURE 2. The web of *Atypus* showing clearly why 'tube-web spider' seems to be the most appropriate name. About three-quarters of the web is underground, and is usually constructed at a steep angle, but not vertically. Drawing by Mike Roberts, from Collins Field Guide *Spiders of Britain & northern Europe*, 1995.

to have occurred in the area long ago (Albin 1736), including spiders like the spectacular orb-web spider *Araneus marmoreus*, the sheet-web spinner *Agelena labyrinthica* and the finely marked chocolate and yellow crab-spider *Diaea dorsata*, the colonies of *Atypus affinis* were thought to be long gone. (Incidentally, there were no recent records of the spider from Wimbledon Common either).

The search for *Atypus*

Hope springs eternal and no one could actually confirm the spider's absence; the writer therefore included it in a list of London spiders (Milner 1987), although at that time the last actual sighting was nearly a century earlier. On reflection it did seem possible that over such a large area some corners where tiny neglected communities of scarce plants and animals did survive could still exist.

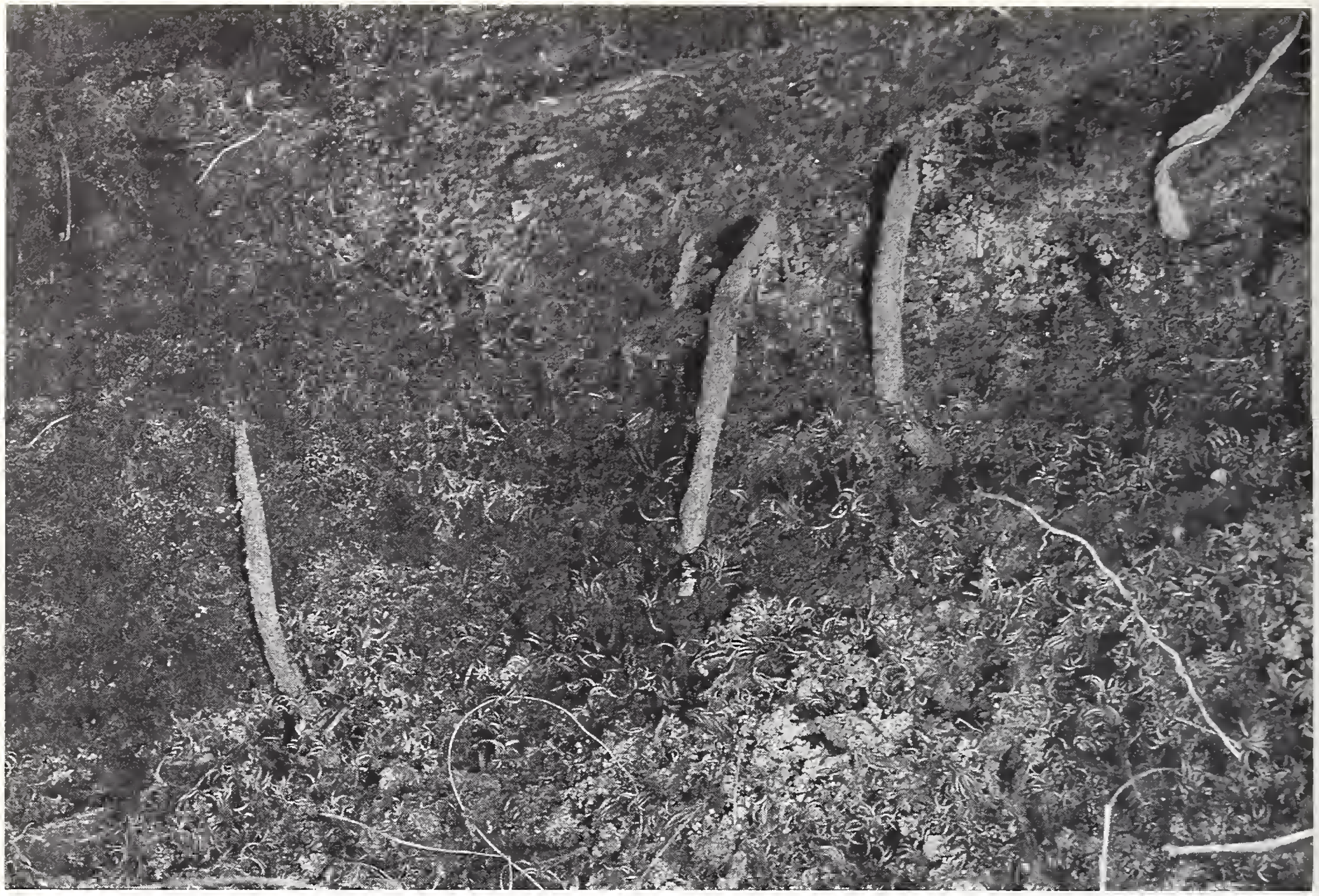

FIGURE 3. Tube-webs of *Atypus* against a mossy bank. *Photo: K.H. Hyatt.*

In 1992 the writer found several heather plants growing in a patch of grass sward on West Heath (Milner 1994). The habitat was not right for *Atypus affinis;* although there were anthills and plenty of evidence of rabbits, the area was partly shaded and rather damp. However some pitfall-trapping was done to see if any species associated with heather or heathland could still be found. The result was negative (Milner 1994) and after that the search continued with, frankly, a dimishing expectation of success.

In 1994, other members of the Society who frequent the Vale of Health area of the Heath mentioned the existence of an unusual habitat on the slopes below Whitestone Pond; steep grassy banks with some natural erosion on dry sandy soil. I was not familiar with the area but it sounded like possible *Atypus* habitat, and so late in September 1994 a visit was made to look specifically for *Atypus* on these dry grassy slopes. It was immediately apparent that the area was more promising than most other sites on the Heath. The slopes were south facing and the vegetation was clearly subjected to water-stress in the summer months. There were large areas of mature and over-mature gorse *Ulex europaeus* bushes as well as large areas of bramble *Rubus fruticosus* agg., some anthills, and plenty of evidence of rabbits.

Close inspection of the steeper parts of the sward where there were tiny eroded gullies was soon rewarded by a remarkable find. What looked at first like some scraps of paper with bits of moss and leaves apparently attached to them turned out to be silk tubes projecting from the soil. Careful digging with a trowel brought for the purpose disinterred a complete web; near the bottom of the completely enclosed sock-shaped construction was a bulge, and this bulge moved! Cutting open the web near the top and gently persuading the 'bulge' to move up the tube, a large reddish adult female *Atypus* appeared, surrounded by 40 or 50 young! The first sight of this remarkable spider at Hampstead for over a century. It must be admitted that the writer's hands shook as the spider and her brood were gently eased into a large specimen tube! Further investigation revealed several other webs nearby.

How had the colony been missed by so many previous observers since 27 October 1877 when Fred Enock finally came upon his long sought-after prize? And could this be the same colony that he had found? For the habitat suitable for *Atypus* would certainly have been more extensive in those days possibly including parts of both Sandy Heath and even West Heath where secondary woodland has subsequently become established. As one of the Society's most knowledgeable Hampstead specialists has pointed out (Softly pers. comm.), Sandy Heath may have been the site of Enock's find.

Spiders on Hampstead Heath

Several other arachnologists have investigated spiders on Hampstead Heath since the last century. In their paper on 'The Arachnida of London', Savory and Le Gros (1957) referred to *A. affinis* on the Heath claiming that it had been recorded both by Enock (1885) and by Dallas (1938). However J.E.S. Dallas, who did describe the spider's habits and list several sites where it could be found near London (mostly on the south-western fringes of the conurbation), did not find *Atypus* on the Heath himself. He records colonies that he found in Epping Forest and at several sites in Surrey and one in Kent, and then states that it 'has also been recorded from Wimbledon Common (Surrey) and Hampstead Heath (Middlesex)'. The latter was presumably a reference to Enock's record although, it is not clear from Enock's description exactly where he found the spider, whether north or south of the Spaniard's Road. The new find is south of that road in what arachnologists refer to as the county of London (the old LCC area), not 'Middlesex' which is used to denote the rest of vice-county 21 outside the old LCC boundary which at Hampstead Heath coincides with the Spaniard's Road.

It was almost certainly present in 1939 as its host-specific predator *Aporus unicolor* (Hymenoptera: Pompilidae) was recorded from the Heath at that date (Guichard and Yarrow 1948).

A survey of the spiders of Hampstead Heath (and Kenwood) was made by Russell-Smith in the early 1970s (Russell-Smith 1978). He did not define the area but as he refers the new records to London county (the old LCC area) he presumably excluded West Heath, Sandy Heath and the Hampstead Heath Extension. He was aware of the old record of *Atypus* but found no sign of the spider himself; in an afterword to Russell-Smith's paper, W.S. Bristowe raised the question of the continued existence of this 'remarkable spider' on the Heath with reference to Enock's papers, and appealed for up-to-date information—apparently without success.

Altogether Russell-Smith found 84 species, several of them new records for the county of London, bringing the total known on the Heath to 91, but he could not find *Atypus* or any of the other spectacular species such as *Araneus marmoreus*, formerly known from the Heath. As a result, it was generally thought that these fine species had probably gone from the Heath for ever — casualties of the development of the great conurbation and general degradation of habitats throughout London.

Observations on *Atypus* at Hampstead in the 1870s and today

For the last recorded sightings of *Atypus affinis* on Hampstead Heath it is necessary to go back to the two papers by north London naturalist Fred Enock in the late nineteenth century. On 6 May and 3 June 1885 he read a paper entitled 'The life-history of *Atypus piceus* Sulz.' to the members of the London Entomological Society, and later published it in that Society's *Transactions*, adding his 'Additional notes and observations' six years later (Enock 1892). Like the present writer he started his search with only a rough idea about what exactly he was looking for:

> 'I started early in 1876 to search the banks at the sides of such lanes as remain around the north of London — at Tottenham, Edmonton, working round towards Hendon, then to Hampstead — which seemed to be the most likely place where I might see the "something hanging down which looked like the cocoon of some moth"; but after many long and weary back-aching searches I began to think I should not be successful; and on March 26th, 1876, I had but a small part of the

> Heath left unworked, this composed of steepish banks, with stunted gorse and broom bushes scattered about. I searched the ground most carefully, and much to the amusement of the keepers and policemen, who seemed to doubt my sanity, my constant reply to their questions being "I am looking for spiders"; and I found that my movements were watched, particularly when I was searching at night.'

The present writer's experiences while observing and collecting spiders on the Heath suggest that members of the general public may be better informed about conservation today, but they frequently ask the same questions that they apparently did in the 1880s. However, today's 'keepers' have become quite familiar with and sympathetic to the idea of spider hunting, and indeed are well aware of the importance of the area for conservation generally. The general level of interest and concern about conservation matters is obviously greater now than a hundred years ago.

> 'I (continued my search) . . . . going on with my nose and eyes almost close to the ground, looking under tufts of grass at the base of various bushes, until at least my attention was suddenly arrested, for there was "the something hanging down which looked like the cocoon of some moth".'

After getting permission from the Superintendent, Enock managed with some difficulty to dig up his 'precious find':

> 'This I did after repeated failures, the tubes being so delicate . . . . After many trials I managed to box seven tubes each containing a female *Atypus* . . . . . I soon found that the colony of *Atypi* was much larger than I at first imagined; but like all so-called "rarities" they only wanted looking for. For I found the nests in the most awkward places to get at — numbers just at the foot of an old gorse bush, which I might not pull up to enable me to get at them; others concealed by stunted bushes of wild sage (*Teuchrium scorodonia*) the tube going down between the roots, and often just when I had reached to within an inch or two of the end, my digger would catch an unlucky bit of root, causing the tube to break short off, the spider escaping by retiring by the back door, a habit they are particularly fond of.'

Enock made detailed observations of the habits of his captured specimens and described their prey capture of biting wandering insects through the well-camouflaged web. From remains inside webs he concluded that the spiders were feeding sometimes on earthworms, but mainly on insects including bees of the genera *Andrena* and *Nomada,* the beetle *Cicindela* sp., muscid flies, woodlice and earwigs. He also suspected that the young *Atypus* spiderlings were often themselves prey for the abundant ants present in the area.

During the summers of 1876 and 1877 Enock visited the site twenty-eight times; only on his twenty-ninth visit, on 20 October 1877, did he find his first 'long-sought after' mature male:

> 'I cannot describe my feelings or my movements at that moment. I only know I was highly excited, and immediately ran to the Highgate Post Office, and sent a post-card to the Rev. O. P-Cambridge, apprising him of my success.'

Subsequently he calmed down and in the next few days found numerous tubes at different sites which contained pairs of *Atypus* spiders, and he concluded that this was the mating period. He found that the eggs were produced in mid summer, the egg-sac being suspended within the tube-web. The spiderlings hatched in August or September, often over a hundred in a single batch, almost a year after the parents had mated.

These further details may give other hints as to the precise whereabouts of Enock's discovery. *Teuchrium scorodonia* is recorded from Sandy Heath but not from the Vale of Health slopes (it does not appear to occur in either area today). There may be another clue in that he ran to Highgate Post Office (to send word to Pickard-Cambridge); if he had found the colony at today's site, Hampstead Village Post Office would surely have been much nearer than Highgate? (Of course this assumes he had no other reason to prefer Highgate Post Office!) Most of Sandy Heath is today covered with secondary oak woodland, with relatively few trees apparently over a hundred years old, and the writer has not so far found any signs of *Atypus* in the few relatively unshaded areas. However Sandy Heath may have been much less densely wooded in those days; some maps from the early part of the century show it as having only scattered trees (Softly pers. comm.). The writer has spent some time searching Sandy Heath; *A. affinis* may have been there in Enock's time, but it does not appear to be there now.

The natural history of *Atypus*

Among the habits of *Atypus* that distinguish it from other spiders in Britain is its web, variously termed a 'purse-web' or 'tube-web', which Enock described in some detail. It is generally about 22 cm long, and shaped like a sock, but with both ends closed. The spider digs a burrow and most of the web is underground, with only the top 4–5 cm outside in the air, usually among the stems of grass or other low herbage. The prey is almost any small insect that accidentally walks over the outside of the web; it is seized from within by the spider using its large and powerful fangs. After being immobilized by the poisonous bite, the prey is then pulled in through the wall of the tube-web, and consumed inside. The hole in the web is then repaired. Individuals are known to live for more than ten years in captivity, and it is possible they do so in the wild; many webs apparently do service for several seasons before being abandoned and replaced. Their life expectancy may be shortened by the occurrence of the predator *Aporus unicolor* (Guichard and Yarrow 1948).

Enock's excellent account includes details of the many experiments and observations he made both in the field and with his captured specimens at home. As W.S. Bristowe remarked (1958), naturalists have been able to add very little to what he learned (although he gives some further details from observations made on related species), and the present writer can only offer his confirmation of a few points. A number of tubes with adult females were found also to contain large broods of spiderlings when investigated in October; these would probably stay in the tube until April the following year if Enock's observations were correct. Furthermore, the males were found to be active only in autumn. Pitfall-traps set in the area produced two adults males between 25 October and 22 November, but none subsequently in later months.

The rediscovery of *Atypus*

When *Atypus* was rediscovered, a press release was issued on behalf of the Society, and the story of the lost tube-web spider on Hampstead Heath was taken up by the local and even national press. A large photograph of the spider together with a (fairly) accurate report appeared in the London *Evening Standard*, the London News on Independent Television ran a story showing the spider and its web in excellent close-up, and several local radio stations also covered the story. The find was reported to and subsequently appeared in the news column of *British Wildlife* magazine (Roberts 1995*a*).

Once the initial excitement died down, the writer made some further investigations in the area of his first find, and compared these observations with those of Fred Enock.

Close examination of the area revealed 20–30 webs all within a radius of a few yards on one of the steepest south-facing slopes; further away, and on slopes facing north or west, no webs could be found. The slopes are covered with a fairly dense grass sward consisting mainly of common bent *Agrostis capillaris* and wavy hair grass *Deschampsia flexuosa*, with some meadow grass *Poa annua* and patches of Yorkshire fog *Holcus lanatus*, as well as much sheep's sorrel *Rumex acetosella*. There are numerous small erosion gullies, and the network of footpaths is generally worn and gravelly.

The extent of the grassy slopes is being slowly reduced by the encroachment of bramble and the growth of young oaks. There are no young oak seedlings becoming established today, presumably due to the activities of rabbits — the earlier period probably about twenty years ago when many did get established may have coincided with the last period of myxomatosis. As the existing young trees grow outwards they shade the grass and several abandoned *Atypus* webs were found under this shade.

During subsequent months more extensive investigation of the surrounding slopes revealed two other areas both about 80 metres from the original site and separated from it by gorse and bramble patches. In the course of these investigations an area of mature heather was found, almost completely hidden by the surrounding bushes. This heather patch is about six metres square, and included vigorous mature growth of both *Calluna vulgaris* and *Erica cinerea.* If, as it appears, this patch is of ancient origin this may be the only naturally-occurring *E. cinerea* in V.C.21. Some *Atypus* webs were found within this heather patch.

In this part of the Heath the gorse bushes are very large and long established; gorse has clearly been growing on this part of the Heath since Fred Enock's time, and now they might be termed 'over mature'. Unlike Enock, the writer was unable to find any *Atypus* webs among the roots of the gorse.

Enock's observations suggest that *Atypus* was hardly widespread in the Hampstead area a century ago, yet it appears to be surviving in more or less similar numbers today. The Heath as a whole has clearly suffered considerable degradation and change as a semi-natural environment in the last hundred years. There continues to be considerable encroachment by secondary woodland over what was formerly heathland, and various plants which were formerly widespread, such as juniper, bilberry, ling *Erica tetralix* and bell heather *E. cinerea,* have disappeared or become extremely restricted in their occurrence. The general increase in disturbance and eutrophication due to heavy use by people and dogs has also contributed to the degradation of the vegetation, as have airborne pollutants.

Enock gives few clues as to the other plants and animals which he found in the area of the *Atypus* colony apart from the gorse and wild sage, unidentified ants, and a crab-spider which he referred to as *Xysticus thomisus* (probably the species now known as *Xysticus cristatus*). However in view if the increased pressures on the whole environment of the Heath it is now very important to know more about the community of animals and plants within which *Atypus* still thrives, if active management of the area to conserve the habitat is to be successful. With this in mind the writer has visited the area on a monthly basis and made a number of observations which have been compared with the findings of earlier authors.

Features of the area today

1. Geology and vegetation of the Upper Heath

The surface geology of the upper parts of the Heath, including the slopes above the Vale of Health round to Hampstead Gate, Sandy Heath and much of West Heath, consists of lower strata of the Bagshot Sands, a friable sandy bed with flint pebbles. Below this is an intermediate bed known as the Claygate Bed, although the precise outline of its exposure on the Heath has not been determined. Below this, occupying all the lower parts of the Heath, is London Clay. In former times the Bagshot Sands were exploited commercially for sand and gravel. Evidence of this extraction can be seen in the surface irregularities in several places, especially on Sandy Heath.

The Bagshot Sands give rise to nutrient-poor, friable sandy soils conducive to the development of typical heathland vegetation with heather, juniper, bilberry, gorse and broom *Cytisus scoparius,* together with grasses such as fescues *Festuca* spp., wavy hair-grass and common bent. Remnants of heathland vegetation have now almost disappeared from the area; as the distinguished botanist A.G. Tansley explained succinctly, 'Traffic often converts a ling-heath into a grass-heath.' (Hampstead Scientific Society 1913). Observations made by the author on Hampstead Heath in recent years (Milner 1993, 1994) suggest that a similar observation could be made with regard to spiders; to paraphrase Tansley, 'traffic converts a grassland assemblage into that of a building site or garden lawn'.

Unfortunately there are no detailed records of changes to the spider fauna of the Heath over the last few hundred years. However, Kent (1975) has traced changes in the flora, the decline from a ling-heath to grass-heath and the disappearance of some of the most typical heathland species. Here are some of the comments on the most typical heath plants quoted by Kent, with some additional comments from other sources such as Burton (1983):

Juniper *Juniperus communis:* 'Formerly native on heaths and commons in Middlesex but long extinct' (Gerard 1597, copied by many later authors). Burton (1983) comments that it has been in general decline throughout south-east England, although the reasons for this are not understood.

Ling or **heather** *Calluna vulgaris:* 'Native on heaths, 1500s' (Gerard 1597); 'present . . . . on the Heath' *c.*1860. (Trimen and Dyer 1869); 'scarce' in 1871 (Walker 1871); 'years ago was a conspicuous feature here, . . . still lingers . . . . near the birches on the West Heath' *c.*1912 (Whiting 1912); 'one plant, 1927' (Richards 1928); 'last seen in 1942' (Burton 1983).

However, as mentioned above, heather does appear to have survived both above the Vale of Health and on West Heath (Milner 1993), both patches flowering in 1995, although the prolonged drought appeared to cause some die back of the Vale of Health patch. There have been several attempted re-introductions in other parts of the Heath, but neither of the present patches appears to have been recently planted, and the larger patch included some very mature, aged plants and a substantial litter layer suggesting it has been there for many years.

Bell heather *Erica cinerea:* recorded from the Heath by Gerard (1597); occurs 'very sparingly, East Heath, Hampstead' (Trimen and Dyer 1869); 'one plant, 1909' (Moring 1920–8); 'still lingers west of Spaniard's Road, *c.*1912' (Whiting 1912); 'not seen on Hampstead Heath for over 60 years, a pattern which could be repeated in many places, changing only the date' (Burton 1983).

Bilberry *Vaccinium myrtillus:* originally recorded by Gerard (1597); it was 'still abundant at Kenwood' *c.*1860 (Trimen and Dyer 1869); but just 'two small patches' in the 1940s (Richards 1928), although it was 'still present around the Lake, East Heath, 1966' (Kent 1975). Softly (pers. comm.) knew of a single plant at the edge of the West Heath bog around 1985 which was subsequently 'overwhelmed' by bramble and disappeared. It has not been seen anywhere on the Heath since then.

2. Mammals

In his account of mammals on the Heath and surrounding area Findon (1913) reported that 'hares can still occasionally be seen in the area,' (though this refers to a wider area than just the Heath itself), and '. . . . there are some rabbits, though few in number . . . . In the banks of adjoining hedges a few burrows are occasionally found, though nothing in the nature of a warren.' No mention was made by Enock about the presence of rabbits, but it is clear that today they are an important factor in maintaining the present vegetation in the area around the *Atypus* colony. Rabbits are now abundant, and they use the cover afforded by the dense thickets of gorse and bramble to hide their burrows. They do not appear to be disturbed much by dogs, which frequent this part of the Heath rather less than elsewhere.

3. Invertebrates

Among the invertebrates, Enock mentions finding the remains of the tiger beetle *Cicindela campestris* in *Atypus* webs. This would be quite a find today! However, from the space devoted to it by Ellison (Hampstead Scientific Society 1913) it must have been fairly common eighty years ago, and as it is an attractive and active species it would be surprising if it has survived undetected. Another attractive species, the dung beetle *Typhaeus typhoeus* is still present; the writer and Dr D.S. Hackett (pers. comm.) have found specimens on the slopes near the *Atypus* colony, on grassy patches occupied by rabbits near Hampstead Gate and in woodland at The Battery.

There are a number of anthills in the area, and both *Lasius niger* and *Lasius flavus* are common, as are the ant-spiders *Phrurolithus festivus* and *Micaria pulicaria*, neither species that are common elsewhere on the Heath. A list of other spiders and beetles taken in pitfall traps (October 1994–June 1995) and by searching in the *Atypus* area is given in Table 1.

Observations on the other spiders occurring on the slopes where *Atypus* is found provide further evidence that the area is a relic of an older community. Pitfall-trapping has been undertaken since October 1994 (to the time of writing, June 1995) and several searches of the grass have also been made. Two salticid spiders, both most unusual for London, have

TABLE 1. Spiders and beetles recorded in the area of the *Atypus* colony on south-facing grassy slopes above the Vale of Health.

1. SPIDERS

Nomenclature follows Roberts (1995*b*).

ATYPIDAE
Atypus affinis

GNAPHOSIDAE
Micaria pulicaria

CLUBIONIDAE
Clubiona reclusa
Phrurolithus festivus

THOMISIDAE
Xysticus cristatus
(*X.thomisus* sensu Enock 1885)

SALTICIDAE
Heliophanus flavipes
Euophrys frontalis
E. aequipes

LYCOSIDAE
Pardosa palustris
P. pullata
Alopecosa pulverulenta
Trochosa ruricola
T. terricola

HAHNIIDAE
Hahnia nava

THERIDIIDAE
Theridion bimaculatum
Enoplognatha thoracica
Robertus lividus

TETRAGNATHIDAE
Pachygnatha clercki
P. degeeri

LINYPHIIDAE–ERIGONINAE
Walckenaeria antica
Dicymbium brevisetosum
Pelecopsis parallela
Pocadicnemis juncea
P. pumilla
Tiso vagans
Erigone dentipalis
E. atra

LINYPHIIDAE–LINYPHIINAE
Agyneta decora
Meioneta beata
Centromerita bicolor
Bathyphantes gracilis
Lepthyphantes tenuis
L. flavipes
L. ericaeus
L. pallidus
L. insignis

2. BEETLES

Nomenclature follows Pope, R.D. 1977: Revision of Kloet and Hincks: A check list of British insects: III Coleoptera. *Handbk Ident. Br. Insects.*

* = thought to be extinct on the Heath today.

CICINDELIDAE
**Cicindela* sp. probably *campestris*

CARABIDAE
Calathus melanocephalus
C. mollis
Metabletus foveatus

HYDROPHILIDAE
Megasternum obscurum

STAPHYLINIDAE
Anthobium atrocephalum
Othius angustus (=melanocephalus)
Philonthus varius
Quedius boops
Rugilus erichsoni
Tachyporus hypnorum
Xantholinus linearis
Zyras limbatus

BYRRHIDAE
Simplocaria semistriata

SCARABAEIDAE
Typhaeus typhoeus
Hoplia philanthus

ELATERIDAE
Agriotes lineatus
A. obscurus

CANTHARIDAE
Cantharis rustica

CHRYSOMELIDAE
Chaetocnema hortensis

CURCULIONIDAE
Barypeithes pellucidus
Caenopsis waltoni
Otiorhynchus singularis
O. raucus
O. ovatus
Phyllobius virideaeris
Strophosomus melanogrammus
Trachyphloeus angustisetulus

been found: *Euophrys aequipes* and *Heliophanus flavipes* both occur on the dry grassy slopes. *E. aequipes* is known from one other site in the London area (Brompton Cemetery), *H. flavipes* from no other site. It is also the only site in the London area for *Entelecara congenera* which has been beaten from the adjacent gorse bushes, which are also inhabited by another species that is extremely scarce in London, *Lathys humilis* (only other known sites in the London area are Highgate Wood and Bentley Priory). Some pioneer species are present such as *Erigone dentipalpis* and *E. atra*, but the commonest 'weed' species elsewhere on the Heath, *Oedothorax fuscus* and *Oe. retusus* are not present. Several lycosids (wolf spiders) that are common in grassland elsewhere on the Heath are present in substantial numbers in the summer months, but as the trapping has not continued for a 12-month period yet it is not possible to make precise comparisons with other sites.

Unfortunately the small patch of heather has proved to be very disappointing from the arachnological viewpoint; so far no species characteristic of heathland have been taken there although pitfall-trapping has been done since October 1994, and several hand searches have also been made.

4. Management implications

Discussion with the Corporation of London who manage the Heath has already resulted in their cutting back some of both bramble and oak branches near to the *Atypus* colonies, and an active programme of reversing the woodland and scrub encroachment in the area is now being considered. It is hoped that this approach can be actively pursued; the minimum size of area for a healthy and sustainable *Atypus* colony to exist is not known, but the present area could be close to that minimum. It is of the utmost importance and urgency that the area of suitable habitat be expanded.

Conclusions

It is of considerable conservation interest that *Atypus affinis* has been rediscovered on Hampstead Heath. The presence in the same area of a number of other plants and spiders that are absent or extremely scarce elsewhere on the Heath suggests that some of the slopes above the Vale of Health are the nearest approximation to a relic of the genuine heathland community that existed over a much wider area of the Heath, in particular covering parts of West Heath and Sandy Heath in former times. But it must be concluded that formerly the area suitable for and probably occupied by *Atypus affinis* colonies was more extensive; indeed it is possible that the colony found by Enock was on Sandy Heath. Much of this area has now become secondary woodland unsuitable for *Atypus affinis*.

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Spider records for the London Area in 1994

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Abstract

Unusual and new records of spiders found in the London Area (counties of Middlesex and London only) are noted with some brief ecological observations. The low number of new county records in the year (one for London and nil for Middlesex) in relation to the total number of spider records for the year is compared with the equivalent figures for 1992 and 1993.

Introduction

By far the most spectacular find of 1994 was the rediscovery of a colony of *Atypus affinis* on Hampstead Heath after more than a century, as reported elsewhere in this journal (pages 127–138). However during the year a number of other interesting finds were made although only one was actually a new county record for London or Middlesex. Some of these records resulted from pitfall-trapping which has continued (e.g. Queen's Wood, Coldfall Wood) or was started (various parts of Hampstead Heath, Highgate Wood, etc.). The Society's Ecology and Entomology Section spider forays also provided a number of new records, and old records reconfirmed. The sites visited during the year on these official forays were Charterhouse Square near the Barbican (part of the old Cripplegate site) in May; Middlesex Filter Beds NR and Walthamstow Marsh West in December. There were also joint forays with Barnet LWT and Barnet Watch Club to Scratchwood on a very wet day in May; and with SW Middlesex Section and Wimbledon Common Conservators to Wimbledon Common (including Farm Bog) in September. Some interesting records were also provided by Dan Hackett.

The records are given below in taxonomic order, that marked **being a new record for London. All records are by the author unless otherwise stated.

DYSDERIDAE

Segestria florentina: This spectacular spider (up to about 22 mm) almost black and with a metallic green sheen on its powerful chelicerae, is thought to be a fairly recent arrival in this country. Locket and Millidge (1951) reported its occurrence as 'very local, almost always at or near a sea port', including Westminster, where Bristowe (1939) had found it in the walls of Westminster School around Dean's Yard behind the Abbey. During the 1994 foray to Charterhouse Square, the characteristic 'spokes of a wheel' webs were found on several old walls, door- and window-frames. This spider is not easy to dislodge, but eventually a number of fine female specimens were collected. There was no previous record of the spider in this part of London, although the old Cripplegate site was investigated in the late 1940s by Le Gros (1949) who would surely have reported *S. florentina* had it been there then. Charterhouse Square is about 5 km from Dean's Yard, so these finds may be evidence of the expansion of this spider's distribution in the past fifty years. Subsequently, Dan Hackett (pers. comm.) found a further colony in an old wall at Thames St, Kew, more than 10 km to the west of the Dean's Yard site. It is very likely that this spider is more widely distributed in London; wherever there are old walls or semi-derelict buildings it should be sought.

Prior to the Charterhouse foray, the writer did go to Dean's Yard to check the presence of *Segestria florentina* at the original site and was delighted to find that the colony survives, with numbers of webs in the old walls of Westminster School as described by Bristowe (1939), and some in fissures in the bark of a number of large old plane trees around the green.

THOMISIDAE

Xysticus erraticus: This is an uncommon crab-spider in the London Area, the only records for London being the pre-1957 record from Victoria Park Embankment, in Greenwich (Savory and Le Gros 1957), and in Middlesex from Monken Hadley Common (Milner 1991). During the 1994 foray to Wimbledon Common (Surrey) a single female was swept from rushes and other low vegetation along a ditch.

SALTICIDAE

Neon reticulatus: During the spider foray to Wimbledon Common considerable numbers of females of this tiny jumping spider were found in sphagnum moss at Farm Bog. The only other record for the London Area is from Stanmore Common, Middlesex.

Marpissa muscosa: A very large female specimen (12 mm) of this brown-and-black jumping spider was sent to me by Dr E. Tuddenham of Muswell Hill who found it in his house, walking up the side of the refrigerator. As it does not normally inhabit houses, and is camouflaged to live on bark, it may have arrived under the bark of firewood logs or possibly with vegetables. Also, J. Galton sent me a specimen from Hendon. In fact there is also an old record for this species from Wood Green, near Muswell Hill as reported by Savory and Le Gros (1957).

LYCOSIDAE

Pirata hygrophilus: Considerable numbers of this marshland wolf-spider were found at Farm Bog, Wimbledon Common in September where both sexes were taken, while the generally commoner *P. piraticus* was not seen.

THERIDIIDAE

Episinus angulatus: This triangular spider, which spins a web from low vegetation down to the ground as a forest of sticky trip-wires, is usually found on heather. The only London records are from Bostall Heath on a small relic patch of *Calluna vulgaris*, and from much more extensive heather at Putney Heath. During the foray to Walthamstow Marsh West, a single adult female was taken among dense herbs in a low-lying marshy area although no heather occurs there. Since this find was in December it suggests that the species may be winter-active, although adult males have yet to be seen at any time of year in London.

Theridion impressum: A single male of this uncommon spider was swept from bushes at Totteridge Fields, Middlesex by Dan Hackett in June; the only previous record for Middlesex being from Fray's Fields, Harefield (Milner 1992).

ARANEIDAE

Gibberanea gibbosa: Two females were swept from bushes and low vegetation at Hampstead Heath Extension by Dan Hackett in May. Previously known as *Araneus gibbosus*, this orb-web spinner is uncommon in the London Area, although it has been recorded on the main part of Hampstead Heath by Russell-Smith (1978), and from Wandsworth Common (Milner 1993). An immature specimen (previously unreported) was also swept from bushes at Big Wood, Hampstead, in 1991.

Cyclosa conica: This strange species, the 'bird dropping spider', was swept from gorse bushes on Sandy Heath (part of Hampstead Heath) in September, and from bushes at Coldfall Wood in May, and also from bushes at Queen's Wood by Dan Hackett in January, all these records being of females. A single male was taken from tall rushes at Scratchwood during the foray there in May. These sites are all in Middlesex; there has yet to be a record from the old county of London.

Agalenatea redii: A single female of this scarce orb-web spinner was from bushes at Totteridge Fields NR in June by Dan Hackett, the only previous record for Middlesex being from Monken Hadley Common (Milner 1994).

LINYPHIIDAE

*Entelecara congenera **:* This small money-spider (Nationally Notable B), first recorded in England only in the 1970s (Locket, Millidge and Merrett 1974), was swept from the area of dense and ancient gorse bushes on the slope above Vale of Health on Hampstead Heath in October.

Milleriana inerrans: This species is known both in England and on the Continent as a pioneer species common on agricultural land; for example it was one of ten species of pioneer spiders found to occur abundantly in the centre of agricultural fields in Belgium by Alderweireldt (1993). In London it is characteristic of disturbed sites such as St James's Park and similar public open spaces where the grassland is subjected to a high degree of trampling, regular machine-mowing, etc. During 1994 two further central London sites were added to its known distribution: Primrose Hill and Kensington Gardens, making a total of eight sites for the county of London. Today, *M. inerrans* is quite a common species in London's open spaces, although it was not recorded at all by previous workers, including even Russell-Smith (1978), who collected many small linyphiids on Hampstead Heath. It seems likely that it has only recently expanded its territory in London, and is probably still doing so. If this is the case it may be as a response to lower pollution levels, or possibly the changed character of pollution from heavy soot and particulate matter deposits, common before the mid sixties when the first Clean Air Act was passed.

Araeoncus humilis: This species is famous in London as having been recorded 'in a No.36 bus' and from only one other south London site, New Eltham, (Savory and Le Gros 1957), but during 1994 two males were taken in a pitfall trap at Hyde Park in December.

Tallusia experta: This species is generally regarded as a marshy-ground inhabitant, but a single male was taken in a pitfall-trap in grassland at Hyde Park in December. It has previously been recorded in London from only a few damp areas; at Camley Street Natural Park, on the nearby banks of the Grand Union Canal, and on Hampstead Heath.

Kaestneria pullata: Nationally this is a common species although there are very few records for the London Area. During 1994 a single female was taken at Walthamstow Marsh West on the spider foray in December, and in the same month another female was taken in a pitfall trap in Queen's Wood, the first record of this species from the wood in six years of trapping!

Panamomops sulcifrons: The tiny 'horned spider', which is very difficult to find, but frequently turns up in pitfall-traps in disturbed grassland, was taken in a trap at Coldfall Wood in May; it has now been recorded from eleven sites in and around London, most of them in the county of London, i.e.,within the main urban area.

Poeciloneta variegata (globosa): This tiny globular spider is characteristically found under large boulders in mountains in northern England and Scotland, as far north as Shetland, and it was found at various places on the outskirts of London, none of them within the county of London as defined by the old LCC boundary, by Bristowe (1939). Subsequently both Savory and Le Gros (1957) and Locket, Millidge and Merrett (1974) included it as a species recorded from London, the former authors referring to Bristowe's records, although no other specific records in London can be found until a record by the present author (not previously reported) of a single female under a large piece of loose concrete on Barnes Common in May 1990.

One of the most interesting finds during the spider foray to Charterhouse Square (which includes part of the old Cripplegate site searched by Le Gros) was the discovery of several specimens of *Poeciloneta variegata* which had spun their webs under large loose blocks of concrete around a car-park on a demolition site. Le Gros (1949) had not found this species at Cripplegate.

Spider parasites

A number of ichneumonid wasps parasitize young spiders. The wasp larvae are generally ectoparasites fixed to the abdomens of the spider host or more rarely to its cephalothorax. Two species were recorded in 1994: *Acrodactyla quadrisculpta*, a parasite of *Tetragnatha extensa* was found at Middlesex Filter Beds in December, and *Acrodactyla degener* was recorded from *Lepthyphantes tenuis* at Kensington Gardens. It is thought that parasites may be more sensitive than their hosts to pollution, so this record from near the centre of London is surprising, however *A.degener* was previously recorded from Euston Square, also from *L.tenuis*.

General comments

From Table 1 it can be seen that the total number of records and the numbers of species recorded (both non-linyphiid and linyphiid) are very similar for the years 1993–1994, yet there was only one new county record (*E. congenera* for London) in the year against a total of eight new county records in 1993, and seven from much fewer records in 1992. The reasons for this are not apparent; the possibility that there are no new records to be found is not confirmed by records so far for 1995 among which are several new county records which will be reported in the next *London Naturalist.*

Table 1. Comparison of spider record numbers for the years 1992–1994. A single record is defined as the occurrence of a species at a particular site on a particular occasion, irrespective of numbers of individuals seen or collected at that time.
M = new records for Middlesex, and L = new records for London.

Year	Non-linyphiid spp.	Linyphiid spp.	Total spp.	Approx. No. of records	New records M	New records L
1992	56	61	117	850	6	1
1993	78	67	145	1,050	5	3
1994	79	69	148	1,150	–	1

Acknowledgements

I wish to thank Dr Peter Merrett for identifying or confirming the identity of most of the specimens referred to, and Dr Mark Shaw of the National Museum of Scotland, Edinburgh, for identifying the parasites. I would also like to thank Paul Canneaux and the Corporation of London who commissioned the ongoing research on Hampstead Heath.

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Book review

Spiders of Britain & northern Europe. Michael J. Roberts. HarperCollins. London. 1995. 383 pp. £14.99. ISBN 0 00 219981 5.

Spiders are known to evoke a wide range of emotions, some of them fairly extreme, as Paul Hillyard's *The book of the spider* made clear last year. Fear and horror tend to be played on by the media, but in fact many people given a chance respond very positively to spiders and especially their often beautiful webs. Spiders arouse intense interest, but until now there has been a major gap in the literature — a well-illustrated layman's field-guide for identification; Dr Michael Roberts has responded to this long-felt want most admirably.

Starting with *Atypus affinis* of Hampstead Heath fame (whose web itself looks a bit like a long-felt want), he describes and illustrates all the larger and many of the smaller spiders of Britain and northern Europe. To make the book a manageable size he has quite reasonably reduced his coverage of the most numerous family, the money-spiders (Linyphiidae). He has also used exclusively his own excellent drawings and paintings of spiders and their characteristic features such as sex organs, as well as a number of fine drawings of different web architecture.

Arachnologists are familiar with Dr Roberts's major work *The spiders of Great Britain and Ireland* (Harley Books 1985–7), which has become a standard work of identification based on his earlier drawings. In the new book he has selected from the larger work in giving information about over 400 species, including some that occur in northern Europe but not in the UK (as yet). He has also included some excellent introductory information about spiders and their biology, together with suggestions about observing and collecting spiders, and about identifying them in the field.

He has also attempted a family key based on physical features, a difficult job since, as the author points out, several of the features which are needed for certain allocation into families are difficult to see even under a microscope. I fear that some of the suggested observations are a little arcane even for more experienced arachnologists. I have to admit that I was unaware that in one family of eight-eyed spiders, when viewed from above, 'a line through the median and lateral eyes of the posterior row crosses the midline ahead of the carapace'. This seems a rather obscure, and to beginners probably discouraging, way of placing your specimen in the Lycosidae or wolf-spider family — when one glance at it running in the grass will tell you what it is even before you can catch it. In my experience it takes even five-year-olds about 12.5 seconds to learn this (and not much longer to learn to catch them), though obviously there are occasions when such observations of a live specimen are not possible.

In fact I suspect that this problem of placing spiders in their correct families which dogs many beginners will not be fully overcome until spider people satisfactorily borrow the ornithologists' concept of 'jizz' — the overall look or *gestalt* of a creature — and apply it to spiders. I do accept, however that what looks obvious as you collect a specimen in the field may look different under a microscope at home a week later.

In fact anyone seriously using this guide will soon know all the common families from comparing their specimens with the drawings and should soon be able to identify most of the spiders they find, at least to the genus. This should have the result that Michael Roberts is hoping for; that more people take up arachnology.

I may have given the impression that this is a worthy but humourless work, but careful reading does reveal something more, for I like the relationship between humans and Arachnida which seems to be conveyed by some of Dr Roberts's comments. At times he almost gives the impression that we are engaged in a trial of wits — a game of cosmic chess perhaps? — with our eight-legged friends. He suggests that some small theridiids seen to 'have evolved [characteristics] specifically to outwit those beginning the study of spiders'. Presumably the selective advantage they gain is that they will be ignored by human collectors who are readers of the *Field Guide*, believing them to be too difficult to identify! But the abiding image of the author results from the experience he relates on page 92, when at around 4 a.m., as he completes a drawing of the beautiful tiny orange *Oonops domesticus,* a live adult of the same species runs across the page. Did it I wonder, pause, glance up at the artist whose work it had arrested and whisper 'Check-mate in two moves I'm afraid!', before racing off the page?

J. Edward Milner

A review of the butterflies and larger moths of the London Area for 1992–1994

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Abstract

Lepidoptera records received for the period 1992 to 1994 for the London Natural History Society's recording area are reviewed, and selected species are mentioned and discussed. This is the first review of records since publication by the London Natural History Society of the book *Larger moths of the London Area* (Plant 1993) which included all records known at the time for the period up to 31 December 1991. A number of records made prior to 1992, but not received until after publication of the above book are also reviewed. The conservation status of *Scopula emutaria* (Geometridae) is altered from 7A (presumed extinct) to 10 (uncertain), and that of *Eupithecia pimpinellata* (Geometridae) is changed from 7B (no recent records) to 4 (extremely local resident). The category 4 status of *Abraxas sylvata* (Geometridae) is confirmed. No new species are added to the London Area total, which remains at 715. A number of records reported add to the distribution maps in *Larger moths of the London Area* but none of the distribution patterns on these maps is significantly altered. This suggests that the status categories applied are valid and may thus be used for assessment purposes where appropriate within the London Area. The nomenclature used in this review adheres to that employed by *Larger moths of the London Area* and in accordance with editorial practice authorities are thus omitted from the scientific names of the species.

Introduction

The last review of London's lepidopterous fauna by me covered the years 1987 and 1988 (Plant 1989). The long gap from then until now was a result of me devoting my time to producing the Society's latest hardbound book *Larger moths of the London Area* (Plant 1993) which shall, hereafter, be referred to as *LMLA* for reasons of brevity. *LMLA* included all known records, for all time, up to 31 December 1991. For production reasons, records received after that date could not be included. Thus, we have, to the end of 1994, three seasons for which Lepidoptera records have not been published for our area and it therefore seems sensible to return to the traditional biennial reviews in the pages of his journal, commencing with a summary of the years 1992 to 1994, but also including any records made prior to 1992 and received too late for inclusion in *LMLA*.

This also presents an opportunity to correct any minor errors which may have been detected in *LMLA*. The reader should note that in producing *LMLA*, extensive and exhaustive researches into the details of various published records were undertaken. Many published errors were detected and corrected in the book. It is neither possible nor necessary to publish them again here but readers of all earlier reviews of London's larger moths should note that if any discrepancy in data is discovered then the evidence of *LMLA* takes preference. If evidence suggests that the contrary is true I should be delighted to hear.

The review is split, as before, into the three entirely artificial separations of Lepidoptera—butterflies, micro moths and macro moths.

BUTTERFLIES

Very few records of butterflies have been received in recent years and of those that were, few have been especially significant. A swallowtail *Papilio machaon* was observed during the afternoon of 7 August 1994 at Redhill, Surrey by Steve Gale; its subspecies and its origins are uncertain, and 1994 was evidently a good year for the brown argus *Aricia agestis*. It was common along the Mar Dyke in South Essex, particularly so adjacent to Watts Wood, near where the A12 trunk road and the M25 motorway interchange. I have specimens from here in my collection that were collected by the late Sidney Bowden in the 1950s. This small brown butterfly was also found in good number by Peter Harvey and myself at a vacant site adjacent to Mill Wood at Grays in South Essex during 1994. Sadly this site is due to be bulldozed. A silver-washed fritillary *Argynnis paphia* was seen twice during August 1994 at Warren Road, Banstead, Surrey by Steve Gale. Perhaps the most important record, however, is of the grayling *Hipparchia semele* which Peter Harvey first located during 1994 at the land by Mill Wood, Grays, just mentioned, I went there with Peter on 3 August 1994 and counted at least a dozen individuals. This in now the only site for the butterfly in the entire London Area. The same site, which is essentially a chalk quarry area with good sections of overlying Thanet Sand remaining, has also generated a large number of *Red Data Book* Aculeate Hymenoptera, and on 3 August 1994 I took only the second British example of the parasitic fly *Gymnosoma nitens* (Diptera: Tachinidae). By the time this review paper is published, the entire site will have been obliterated and built upon.

MICROLEPIDOPTERA

For a variety of reasons, Microlepidoptera are not covered in the present review. One reason is that so few records have actually been received that the exercise is scarcely worthwhile. Nevertheless, as most members of the London Natural History Society will already be aware, I am currently compiling records of Microlepidoptera for the vice-county of Middlesex (v. c. 21), for which county the last list published was in 1891. Records are sought from competent persons. Data required will include species name, *Log Book* number (to avoid confusion over name changes), date of record and locality. Records will be assumed to relate to living imagines unless stated to the contrary (e. g., vacant mine, tenanted mine, larva, pupa, cases, etc.). Locality names should be those used on the 1:50,000 OS map and will ideally be accompanied by a four-figure grid reference. Overnight trap dates should be given according to the example 23/24 September or 23 September, and not as 24 September. Counts and sexes are requested for immigrants. A hand list of species recorded may be available from the author by the time this review is published in autumn 1995.

Non-specialists may also contribute by sending specimens from light fittings, window sills, electrocution traps in shops and other sources. Please state if such material is to be returned or else it will be discarded.

LARGER MOTHS

Introduction

LMLA, covered all records up to the end of 31 December 1991 — assuming that they were submitted to me in time for inclusion. The present review covers records made for 1992, 1993 and 1994, but also includes earlier records that were not submitted in time. I have spent a great deal of time considering how best to present this review. Traditionally, records have been reviewed by me, and by the Baron de Worms before me, on a vice-county basis. This has been criticized by some who would prefer to see the review arranged taxonomically, as in *LMLA* and praised by others who are more concerned with different geographical areas. After much discussion I have decided to do a bit of both! Record of immigrants are pulled out to a separate section, and listed chronologically in the same style as may be found in *LMLA*. All reported records are listed. I have followed this with the traditional vice-county 'tour', mentioning interesting records in groups against the name of the contributor. Next, I have prepared a short summary of the most important records and arranged this taxonomically, using the identifying code number for each species. This should help non-specialist ecologists who are concerned to update the status categories to permit accurate use of the larger moths in environmental assessment in the London Area. In this summary I have included any corrections to the published maps and all species recorded as new in any particular vice-country area of London. Two changes in status category and one confirmation of categorization are also included.

Finally, because in *LMLA* I provided a map of the distribution of all resident breeding species of larger moth in our area, I now provide a map for the pimpinel pug *Eupithecia pimpinellata* which has been recorded as larvae in the Hertfordshire portion of the London Area (Figure 1).

No one who ever produces a distribution map of any animal or plant should ever feel that it is complete. However, one may feel able to reach a stage when sufficient data have accumulated to permit the *overall pattern* of distribution in a given area to be assessed. The true test of the accuracy of such an assumption is publication: it is amazing how many people one had never previously heard of crawl out from the metaphorical woodwork and complain bitterly that their own records have been omitted as soon as it is too late to add them! So it was that I reached the decision that publication of *LMLA* should proceed. Since then, a very large number of additional tetrad records have been received. I have not counted, nor have I any intention of doing so, but as I enter these new records to the maps in my own copy of the book only a handful relate to the period ending on 31 December 1991: almost all are additional records made since that date. Further, and rather more importantly, with the exception of two species, none of the overall distribution patterns on any of the published maps are significantly altered and no alteration is necessary to any of their status categories. This is extremely pleasing and it suggests that my categories and overall distribution patterns have proven to be sufficiently accurate to permit the larger moths now to play a role in ecological assessment, as was the intention. The two exceptions are extraordinary. The rosy wave *Scopula emutaria* was taken in Dartford, West Kent (vice-county 16) in 1993 and its status must be altered from 7A (presumed extinct) to 10 (uncertain). *Eupithecia pimpinellata* (Geometridae) is changed from 7B (no recent records) to 4 (extremely local resident) because of the discovery of larvae in Hertfordshire.

Immigration summary

LMLA listed all records of immigrant Lepidoptera that I had received for all time up to the end of 1991. The following is a summary of all records of immigrant Macrolepidoptera received since that publication. In addition to post-1991 records, there are some earlier records which reached me after publication. Records are presented in taxonomic then chronological order.

Vestal *Rhodometra sacraria:* Potters Bar, Middlesex, one on 31 August 1993 and one on 29 September 1993 (J. King); Wimbledon, Surrey, one on 4 August 1994 and one on 22 August 1994 (J. V. Dacie); South Mimms, Hertfordshire, one on 21 August 1994 (Robinson); Richmond Park, 1994 (M. Parsons).

The gem *Orthonama obstipata:* Islington, Middlesex, one on 20 May 1989 (observer name not recorded).

Humming-bird hawk-moth *Macroglossum stellatarum:* Streatham, one on 19 September 1993 and one on 12 August 1994 (F. W. Lockwood); Banstead, one at honeysuckle in a garden on 27 August 1994 (S. Gale); Long Ley, Harlow, one on 3 September 1994 (W. Last).

Orange footman *Eilema sororcula:* South Croydon, Surrey, one on 29 May 1992, presumed an immigrant on the basis that other examples were caught on the Dorset coast at the same period (G. A. Collins).

Dark sword-grass *Agrotis ipsilon:* Ealing, Middlesex, 1994 (P. Brown); Halstead, West Kent, one on 21 November 1994 (J. East).

Delicate *Mythimna vitellina:* South Croydon, Surrey, one on 25 September 1992 (B. Skinner).

Angle-striped sallow *Enargia paleacea:* Orpington, West Kent, 5 November 1992 (I. Ferguson).

Small mottled willow *Spodoptera exigua:* Ealing, Middlesex, 1994 (P. Brown).

Scarce bordered straw *Heliothis armigera:* South Croydon, Surrey, one on 28 September 1992 (G. A. Collins).

Bordered straw *Heliothis peltigera:* Halstead, West Kent, one on 5 August 1994 (J. East); Wimbledon, Surrey, one on 7 August 1994 (J. V. Dacie); Long Ley, Harlow, North Essex, one on 9 August 1994 (W. Last).

The ni moth *Trichoplusia ni:* South Croydon, one on 19 July 1992 (G. A. Collins).

VICE-COUNTY ANALYSIS OF RECORDS RECEIVED

V.C. 16, West Kent

A most helpful contribution has come from Brian West who lists a number of species of larger moth not indicated on the published maps for his home tetrad at Dartford. Perhaps the most important amongst these is the rosy wave *Scopula emutaria*, last seen in the London Area as a whole in 1954 at Pinden. As this was also the only London Area record of the present century I had foolishly assumed that the moth was extinct here. Mr West's 1993 garden record cannot be taken as evidence of residency, but certainly the application of Category 7A no longer applies to this species and I am reassigning this moth to category 10 (status uncertain). Another excellent record is of the festoon *Apoda limacodes*, recorded on 10 July 1989 and in all subsequent years in increasing number. The number of old records dotted on the distribution map in *LMLA* clearly indicates that Kent was a former stronghold of the species in our area, though until now there had been no confirmation of its continued presence since before 1951. The species is also recorded in 1993 from Banstead, Surrey by Steve Gale (see below). Other valuable records from Dartford that were not available to me in time for inclusion on the published maps include the flame carpet *Xanthorhoe designata*, first seen here in 1987 and now with a few recorded each year, the large twin-spot carpet *Xanthorhoe quadrifasiata*, which is evidently becoming commoner, the netted pug *Eupithecia venosata*, recorded on 4 June 1983 but then not seen again until 1992 and 1993 and the August thorn *Ennomos quercinaria*, only reported from three other Kent-in-London localities in recent years. New ten-kilometre square records for TQ 57 are provided by the small engrailed *Ectropis crepuscularia*, recorded from three examples only, one each in 1989, 1990 and 1993, and by the purple clay *Diarsia brunnea* recorded every year, whilst careful examination of genitalia preparations has enabled dots for both the common rustic *Mesapamea secalis* and the lesser common rustic *M. didyma* to be added to the map here. Elsewhere in the metropolitan area of West Kent, Brian reports larvae of lead-coloured pug *Eupithecia plumbeolata* regularly at Darenth Wood and wonders if the record for Dartford in tetrad TQ57A on the distribution map should refer to this site instead. Since that record was submitted by Brian himself then clearly this must indeed be the case; the record for TQ57A should be deleted, and records for TQ57Q and TQ57R should be added.

Mike Halpin found a larva of the oak eggar *Lasiocampa quercus* at Dartford Heath on 5 August 1994. This, together with three other new Kentish records further strengthens to distribution of this moth in south-east of the London Area; it remains absent from most of the western half of the recording circle.

Paul Sokoloff has, as usual, sent me some very interesting information of moths in the West Kent part of the London Area, including several additions to the distribution maps. In particular he reports a small colony of the beautiful yellow underwing *Anarta myrtilli* which has sustained itself on a small patch of heath in the Bromley area for many years, despite pressure from walkers, dogs, horses, fire and an adjacent main road. He tells me that the site seems to produce smaller and darker specimens than the norm; since this makes this vulnerable colony a target for collectors I am suppressing the location. It is comforting to know that the local authority has sought advice on how best to manage the heather on the site so that the moths can be retained. Another vulnerable species in the London Area as a whole is the clouded magpie *Abraxas sylvata*. In the *LMLA* I reported a single occurrence during the 1980 to 1991 period — in Hertfordshire. This related to a single record in a light-trap in 1987. It seemed likely that the moth had become extinct as a breeding resident in our area though I placed it in Category 4 (extremely local residents) on the basis that it may yet prove to be hanging on somewhere. I am delighted to say that Mr Sokoloff has informed me of a small colony that has persisted for many years in our portion of West Kent and that he noted a number of individuals during 1994. A small number of other observers have also reported this colony to me. The location is suppressed as the moth is extremely vulnerable in our area to over collecting and I repeat my comments in the book that any breeding colony of this moth in our area should be rigorously protected. It is perhaps worth recording here that Ian Ferguson bred the parasitoid *Distatrix* (= *Apanteles* sensu lato, in part) *formosa* (Wesmael) (Hymenoptera: Parasitica) from a larva collected at this site in 1993, the identification having been made by Dr Mark Shaw at the Royal Scottish Museum. To complete Paul's notable records, he took a single poplar kitten *Furcula bifida* in his garden trap at Bromley on 15 June 1994; this is evidently new to square TQ 46, as are his records of small elephant hawk *Deilephila porcellus*, also from his garden at Bromley.

Undoubtedly the best of Ian Ferguson's captures for 1992 was a single, rather worn angle-striped sallow *Enargia paleacea* which presented itself in his garden trap at Orpington on 5 November — only the twelfth London Area record of what here is an immigrant, but which further north in England is a resident. Mr Ferguson also totted up the numbers of each species caught in his garden trap for 1991 to 1993 and provided me with his 'top ten' listing. It perhaps comes as no surprise that poll position was occupied by the heart and dart *Agrotis exclamationis*, but it rather surprised me to find the familiar large yellow underwing *Noctua pronuba* — in second place during 1991 — knocked down into third place by the lesser yellow underwing *N. comes* in 1992. Ian is not the only person to record a (welcome?) fall in numbers of *pronuba* and it seems that it may have declined generally across the area in 1992. However, this is not the only species to demonstrate a significant change in capture numbers — see Table 1.

Species	**1991**	**1992**	**1993**
Agrotis exclamationis	226	300	249
Agrotis puta	13	53	31
Noctua comes	76	116	59
Noctua pronuba	155	86	86
Apamea monoglypha	100	55	18
Lacanobia oleracea	13	50	24
Xestia c-nigrum	117	42	26

TABLE 1. Numbers of examples of selected species of moths in an Orpington garden from 1991 to 1993.

During 1993 Ian also visited Scords Wood at Toys Hill on 25 June and recorded 42 macros, of which 40 were new tetrad records. Notable amongst these were the satin lutestring *Tetheella fluctuosa*, the clay triple-lines *Cyclophora linearia*, the scallop shell *Rheumaptera undulata*, the peacock moth *Semiothisa notata* and the beautiful snout *Hypena crassalis*.

Several new tetrad records were also made by Ian at Downe Bank on 20 August 1983. These included the treble-bar *Aplocera plagiata* amongst others.

A most remarkable West Kent record was made by Peter Jupp on the night of 12 July 1994, when a female heart moth *Dicylca oo* in excellent condition entered his garden trap at West Wickham. This is the first record for Kent in London since 1919 and it was believed until now that this attractive moth was extinct in that area. West Wickham is an historic locality for the moth, where it was evidently common exactly 100 years ago; it is most interesting indeed to speculate on whether or not a small resident population still persists in one of the local woods. Peter's record is written up in more detail in *The Entomologist's Record* **107**: 40–41.

John East has kindly sent me a list of 295 macro moths from his garden at Halstead, tetrad TQ46W, 171 of which were new for the tetrad (including 16 category 3 species and seven category 4 species). Amongst the more notable species is the scarce tissue *Rheumaptera cervinalis*, with two on 30 April 1993 and singles on each of 28 April, 29 April and 3 May 1994 — the first records for West Kent in the current (post-1979) period. Apart from here, there are only four known current localities for this moth in the London Area — all in Surrey — and it had been supposed that it had ceased to be resident species elsewhere. Equally scarce in the London Area as a whole is the scallop shell *Rheumaptera undulata*; Mr East took singles at Halstead on 6 and 17 July 1992. The waved black *Parascotia fuliginaria* was taken on 29 July 1993; this species is still decidedly local in London, but is evidently spreading south of the River Thames. It is still most numerous in Surrey where there are now eleven current localities; this Halstead record brings the West Kent localities up to three. Mr East also took the pale pinion *Lithophane hepatica* on 27 March 1992, bringing to five the current sites for this species in the London Area, and a rufous minor *Oligia versicolor*, new to the London portion of West Kent, on 30 June 1992. Other notable species recorded here include the juniper carpet *Thera juniperata* on 24 October 1992 and on 31 October and 4 November the following year, the pale November moth *Epirrita chrystyi* — surely an under-recorded species, the narrow-winged pug *Eupithecia nanata*, the dwarf pug *E. tantillaria*, the square spot *Paradarisa consonaria* and the privet hawk *Sphinx ligustri*, amongst others. The clay triple-lines *Cyclophora linearia* was taken on 14 May 1992 and the migrant bordered straw *Heliothis peltigera* was taken on 5 August 1994.

Ian Brydon managed to add seven new species to his garden list at Bexley during 1993. These included the maiden's blush *Cyclophora punctaria* and, a surprising earlier absentee, the July highflier *Hydriomena furcata*. Perhaps more interesting species here included the streak *Chesias legatella* and the peacock moth *Semiothisa notata*. Ian also points out to me the earlier omission of his record of scarce footman *Eilema complana* at this same locality.

V.C. 17, Surrey

As usual, Steve Gale has sent me impressive lists from his garden trap at Banstead. The most important record is that of a festoon *Apoda limacodes* taken on 25 and 26 June 1993. Together with Brian West's records from Dartford, discussed above, this raises the number of London Area localities for this scarce moth to four. Amongst several other additional tetrad records made by Steve is the yarrow pug *Eupithecia millefoliata*: this represents the first ever record of this species in our part of Surrey and it is a long way from the established population centre along the River Thames corridor to the east of the Essex/Middlesex boundary. Another surprising capture was of the least black arches *Nola confusalis* on 11 May 1993. This too is well away from the established centres for the moth. The coronet *Craniophora ligustri* was taken here on 14 July 1993 and is only the fifth London Area locality for this moth. Other new tetrad records made during 1994 by Steve Gale include the scorched wing *Plagodis dolabraria*, on 19 and 24 June, a single humming-bird hawk moth *Macroglossum stellatarum*, which was noted at honeysuckle flowers on 27 august, the lobster moth *Stauropus fagi*, on 1 June and the slender brindle *Apamea scolopacina* on 30 July.

Mark Parsons has sent me a most impressive list of insects for Richmond Park, Surrey, including 186 species of larger moth. Many of these are particularly interesting and several of which provide the first-ever records for the ten-kilometre square TQ 17. The yellow-legged clearwing *Synanthedon vespiformis* was noted on 3 July 1993 — it was last seen in Richmond Park during the last century. The yellow horned *Achlya flavicornis* represents the Thyatiridae. Amongst the notable Geometridae recorded are large emerald *Geometra papilionaria*, plain wave *Idaea straminata*, barred yellow *Cidaria fulvata*, May highflier *Hydriomena impluviata*, Haworth's pug *Eupithecia haworthiata*, shaded pug *E. subumbrata*, narrow-winged pug *E. nanata*, larch pug *E. lariciata*, the peacock moth *Semiothisa notata* (a particularly interesting record), great oak beauty *Hypomecis roboraria* and the brindled white-spot *Paradarisa extersaria*. Ten species of Noctuidae recorded here warrant mention, all being new for the ten-kilometre square. These are the white-line dart *Euxoa tritici*, triple-spotted clay *Xestia ditrapezium*, light brocade *Lacanobia w-latinum*, hedge rustic *Tholera cespitis*, double line *Mythimna turca* (of which, more in a moment), obscure wainscot *Mythimna obsoleta*, brindled green *Dryobotodes eremita*, rosy minor *Mesoligia literosa*, small rufous *Coenobia rufa* and waved black *Parascotia fuliginaria*. By far the most interesting records were those of *M. turca* which was recorded in each year from 1992 to 1994 with approximately 50 being seen at seven mercury-vapour lights set in High Wood on 3 July 1994. Larvae were found feeding here on common bent grass *Agrostis tenuis* and on creeping soft-grass *Holcus mollis*. One is forced to wonder if this clearly thriving colony is the source of the single moths taken at Tolworth on 11 July 1987 and at Wimbledon on 20 July 1991 and 28 July 1993, our only other post-1979 records.

Mark Parsons also sent me a list of 65 species from an actinic trap run in a garden at Stanton Road, Raynes Park. These are all new records from a previously completely unrecorded tetrad and include the rosy minor *Mesoligia literosa*.

The capture of another example of *Mythimna turca* at Wimbledon on 28 July 1993 has already been mentioned in passing. The source was, of course, Sir John Dacie, in whose garden the moth was trapped. Sir John also communicated several other interesting records from Wimbledon. The alder moth *Acronicta alni* was taken by him on 21 May 1992 and is a repeat record for this site. The marbled coronet *Hadena confusa* on the other hand is new; one came to light on 2 June 1992. The reddish light arches *Apamea sublustris* was noted by Sir John in 1974. Two records, on 9 July 1992 and 2 July 1993, now update the distribution map without altering the overall pattern of distribution across the London Area. In 1994, John added a further seven macros to his already enormous garden total. The blossom underwing *Orthosia miniosa* was noted on 29 April — only the seventh current record for the London Area, the great oak beauty *Hypomecis roboraria* came on 12 June, the rosy footman *Miltochrista miniata* on 13 July — the furthest current record in towards central London, the small rufous *Coenobia rufa* was captured on 2 August and with Mark Parsons' record from Richmond Park this brings to eight the total number of London localities for this moth. Two vestals *Rhodometra sacraria* were noted, on 4 and 22 August, whilst on 7 August another immigrant, the bordered straw *Heliothis peltigera* was captured. Finally, a December moth *Poecilocampa populi* was noted on 18 November.

Further towards the central London Area, Martin Honey has recorded some very interesting species from the Barn Elms Reservoir site during 1994. Amongst the more noteworthy are the white-line dart *Euxoa tritici* on 26 and 29 July — not at all common in the inner area, the autumnal rustic *Paradiarsia glareosa* on several dates in September and October — strengthening the western London distribution pattern of this moth, the southern wainscot *Mythimna straminea* on 26 and 29 July — an unexpected find and the most westerly to date for our area, the large ranunculus *Polymixis flavicincta* on 10 October — almost the most northerly London record and certainly the most urban one, and the bulrush wainscot *Nonagria typhae*, which though not uncommon in London as a whole is here recorded at a new location quite isolated from the nearest known colony and evidently thriving on *Typha* growing at Barn Elms.

Moving further out to Mugswell, Adrian and Olivia Hall have added 27 new species to their already impressive garden list for the three years under review. These included the water carpet *Lampropteryx suffumata*, the dark umber *Philereme transversata*, the streak *Chesias legatella*, the light feathered rustic *Agrotis cinerea*, the beautiful brocade *Lacanobia contigua* and the minor shoulder-knot *Brachylomia viminalis*.

From his garden in South Croydon, Bernard Skinner reports three quite interesting moths for the years 1992 to 1994. Most notable is the maple prominent *Ptilodontella cucullina* taken on 1 July. At the time of writing *LMLA* this moth was regarded as being absent from the entire Surrey vice-county. I do not know if there are now other Surrey localities, but Bernard's record is certainly the first for our part of that county since before 1953. The most likely explanation for its presence is that it was a wanderer from one of the West Kent localities not too far distant. Bernard also had a single delicate *Mythimna vitellina* — an immigrant species — on 25 September 1992, only the thirteenth for our area, and the following year he took an alder kitten *Furcula bicuspis* on 10 June: 1993 also presented him with a tawny pinion *Lithophane semibrunnea* on 9 April and an extremely late marbled carpet *Chloroclysta truncata* on 3 December.

Elsewhere in South Croydon, Graham Collins reports four new species for his garden tetrad during 1992. Three of these were immigrants. The scarce bordered straw *Heliothis armigera* was taken on 28 September, the ni moth *Trichoplusia ni* was noted on 19 July and an orange footman *Eilema sororcula* was trapped on 29 May. The latter species is an extremely local resident in the London Area, with a single known breeding site (in Epping Forest, South Essex); other records are assumed to relate to vagrants. Graham's 1992 record was made at a time when a number of other examples were being captured in light-traps along the Dorset coastline. One resident species added to this same tetrad was the pale pinion *Lithophane hepatica*, taken on 8 April. This extends the date range recorded for this species (previously reported dates all relate to May) though this is no real surprise as the species hibernates in the adult stage.

On the edge of our area at Headley Warren Nature Reserve and nearby, Humphrey Mackworth-Praed has, during 1994, recorded a great number of additions to the distribution maps for which I am most grateful. These include the five-spot burnet *Zygaena trifolii* ssp. *palustrella*, the beautiful carpet *Mesoleuca albicillata*, the water carpet *Lampropteryx suffumata* on 28 and 29 April, the common heath *Ematurga atomaria*, with a male on 27 May and a female on 18 June, the great prominent *Peridia anceps* on 11 may, the marbled brown *Drymonia dodonaea* — a new ten-kilometre square record, the light feathered rustic *Agrotis cinerea* at two separate sites on 19 and 24 May, the triple-spotted clay *Xestia ditrapezium* on 2 July, and finally the square-spotted clay *Xestia rhomboidea*. The last is far and away the most important, and whilst preferring for the time being to retain the species in Category 10 (uncertain status) I may need to revise my stated opinion that it is '. . . now probably only present as a vagrant'. Moths were recorded from three different tetrads on the three nights of 3, 4 and 5 August.

Mr Dominic Couzens ran a trap in his garden in Richmond Park Road, SW14 during 1993 and recorded 96 species of larger moth, all of which were new for the tetrad. Of these, three were new ten-kilometre square records, in spite of being common species in the area. These were the V pug *Chloroclystis v-ata*, the spring usher *Agriopis leucophaearia* and the willow beauty *Peribatodes rhomboidaria*.

At Purley, Mr Pat Sellar also added a few new tetrad records from his garden trap. In 1992 it was the dwarf cream wave *Idaea fuscovenosa* that was of greatest interest together with seven other newcomers; the following year, entertainment was provided by the oak-tree pug *Eupithecia dodoneata* on 20 April and the seraphim *Lobophora halterata* on 15 June.

V.C. 18, South Essex

On a visit to Beckton Level during July 1993, in the company of John Archer of the London Ecology Unit, I was surprised to discover a freshly emerged male Webb's wainscot *Archanara sparganii*, still drying its wings on a stem of *Typha latifolia*, just above the water level in a well-vegetated ditch. A return visit later that evening with the necessary boxes produced well over 30 pupae from the *Typha* stems and evidence of a great many more, as well as pupae of the bulrush wainscot *Nonagria typhae*. Careful searching of the entire area during the next few days demonstrated that almost all of the remaining drainage ditches in this area that had a reasonable quantity of *Typha* growing produced the moth in good numbers.

The only other South Essex record of note seems to be the single pale-lemon sallow *Xanthia ocellaris* which I found in the Rothamsted Insect Survey light-trap on the roof of the museum store in East Ham High Street during the third week of September, 1992. There is a line of hybrid black poplars about two kilometres distant where this species could perhaps be breeding, but this seems rather a long way off. There is (apparently) no other suitable breeding site in the immediate vicinity.

V.C. 19, North Essex

This neglected corner of the London Area has seen the welcome addition of a new field recorder during 1994 in the form of Bill Last (another birder on the road to conversion!!!). Bill's initial efforts at his garden in Long Ley, Harlow produced a list of 195 confirmed species, almost all of which were new tetrad records. Several were of particular interest: six examples of the brown-tail *Euproctis chrysorrhoea* (one each on 13, 18, 20 and 21 July, with two on 19 July) is interesting. The species has, thankfully, not yet established itself as far north as Harlow. I get individuals each year ten kilometres or so further north at Bishop's Stortford and we have always assumed that these were just inevitable wanderers. Six in five nights at Harlow suggests that the Town Council ought to stand guard, ready to nip any invasion in the bud before it can blossom. Bill's record of a maiden's blush *Cyclophora punctaria* is particularly good as it provides the first for the London portion of the North Essex vice-county. The fern *Horisme tersata* taken here represents our most north-easterly record for the London Area. A glance at the map of *The surface geology of the London Area* (Plant 1994) taken with a knowledge of the larval foodplant of the fern suggests that the moth could be under recorded on the chalky Boulder Clay in the north-east of our recording area. A privet hawk *Sphinx ligustri* taken on 27 June is another new record for the London portion of vice-county North Essex. It is interesting that a little further north, outside our area, on the Hertfordshire/Essex border, this moth has shown a steady sign of increase from 1992 to 1994. A tawny pinion *Lithophane semibrunnea* was taken on 26 March, having evidently emerged from hibernation, and is also new to our portion of v.c. 19. It is locally common in the woods just beyond our recording circle in the north-east sector. A further 15 species taken by Bill provide wholly new records for the ten-kilometre square TL 40.

V.C. 20, Hertfordshire

Regrettably few Hertfordshire records have been forthcoming for the three years covered by this review. Mr C. M. Everett provided the exception with his useful list of species from several localities, which

1845 Eupithecia pimpinellata (Hb.)

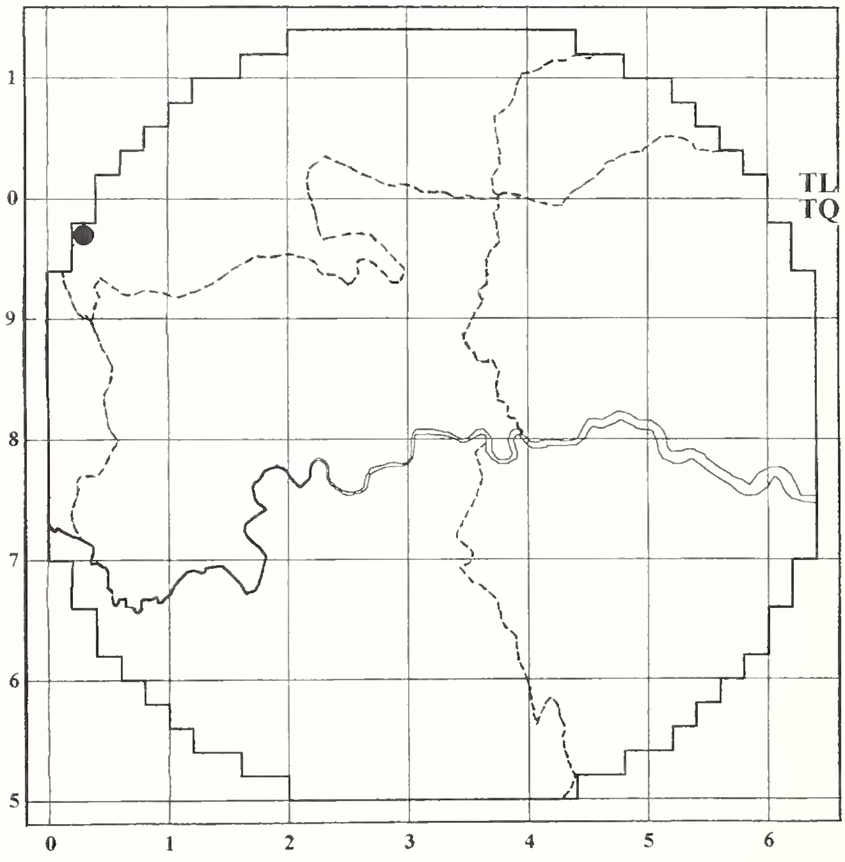

FIGURE 1. The Hertfordshire record of the pimpinel pug *Eupithecia pimpinellata* in 1994 is the first for the county and the first for the London Area since 1975.

included several new tetrad records. Most noteworthy was the Mother Shipton *Callist* *mi* which he found at Garston Park on 13 June 1994, so placing a dot in an otherwise larg lacuna on the distribution map.

It is frequently the commoner species of moth that are omitted from lists sent to me, rarer species normally being given proportionally greater attention. How refreshing it is, therefore, to see that Jon King has recorded the cinnabar moth *Tyria jacobaeae* from no less than 14 Hertfordshire tetrads during 1993. If everyone could find the time to report these common occurrences to me then we would soon have complete maps for these more prevalent species.

By far the best record for Hertfordshire during the period under review was the discovery of a category 7B (no recent records, but perhaps overlooked) moth during 1994, by John Chainey and Jenny Spence who, together, located the larvae of the pimpinel pug *Eupithecia pimpinellata* on plants on plants of *Pimpinella saxifraga* at Sarratt Bottom. This is the first London Area record for the species since 1975, when larvae were found at Thorndon Park in South Essex. The moth now moves up to distribution category 4 and warrants publication of a distribution map (Figure 1). Interestingly, it is the only record ever for our part of Hertfordshire, so my earlier categorization as a species that may have been overlooked seems justified. The larvae are reported to have been heavily parasitized, though I have no data on the name of the parasite involved.

V.C. 21, Middlesex

Sadly, Bill Minnion, one of our longest-standing contributors of Middlesex Lepidoptera records, recently passed away to that great collecting ground in the sky. Bill will be remembered for, amongst other things, the discovery in Britain of the balsam carpet *Xanthorhoe biriviata* on the western edge of our recording area at Denham Lock Wood. This leaves a large gap in the flow of records from the Pinner area. The last list I have from him is for 1992 and he highlighted the appearance of several interesting species including purple thorn *Selenia tetralunaria*, maiden's blush *Cyclophora punctaria* and puss moth *Cerura vinula* amongst others.

Jon King has again been actively recording in the Potters Bar area of Middlesex and has sent me a comprehensive list. A number of species listed include a Mother Shipton *Callistege mi* noted on 5 June 1993. Jon also points out two records of the migrant vestal moth *Rhodometra sacraria*, from Potters Bar on 31 August 1983 and 29 September 1983, which are absent from the *LMLA*. I have to thank Jon for these; experience of his neatly laid out and very comprehensive recording sheets leads me to believe that blame for the omission is mine.

David Rear did not begin moth trapping in his garden at South Hampstead until 1991 so was unable to submit any records in time for inclusion in *LMLA*. His list for that year contains a number of additions for the tetrad, including the magpie moth *Abraxas grossulariata*, the chamomile shark *Cucullia chamomillae* and Blair's shoulder-knot *Lithopane leautieri*. Doubtless we shall hear more from Mr Rear as the years progress; his trap is a welcome addition to the recording effort in Middlesex.

Paul Brown has sent me a list of 83 macros from his garden at Ealing, all recorded during 1994. These include the dotted rustic *Rhyacia simulans* which is poorly reported since 1991 and has evidently not spread quite as I predicted that it might do in the book. The large ranunculus *Polymixis flavicincta* that came to light on 6 October represents only the third Middlesex record and the first in the current (post-1979) period. Four pugs, the slender *Eupithecia tenuiata*, Freyer's *E. intricata arceuthata*, wormwood *E. absinthiata* and plain *E. simpliciata* are new ten-kilometre square records. There can be no doubt that identification problems rather than reality account for the apparent scarcity of several species of pug in the London Area.

Ray Softly has, as always, been active in the Hampstead area of north London. Amongst several valuable records he lists a fine fresh specimen of the black arches *Lymantria monacha* on 2 August 1994. This provides us with only the second current Middlesex site for this moth. Its presence is a complete surprise and one hopes that it may indicate an undetected breeding site on nearby oak trees, perhaps on Hampstead Heath. During the previous year. 1993, a late foxglove pug *Eupithecia pulchellata* was noted on 14 August — exceptionally late for our area, and five new species were recorded for the tetrad. The mallow *Larentia clavaria* was noted on 12 October 1993 (previously recorded in 1898 for Highgate, but otherwise not noted for the Hampstead area) and the green carpet *Colostygia pectinataria* was trapped on 18 September in the same year. Most surprising was a record of the netted pug *Eupithecia venosata* at light on 28 May 1993. This is the only current record north of the Thames in the London Area and as such is of great importance. Ealing and Clapton, during the last century, are the only known other Middlesex localities for this moth, whose larvae feed inside the seed capsules of *Silene vularis*. The sallow kitten *Furcula furcula* was noted on 9 August and finally Ray trapped four brindled green *Dryobotodes eremita* between 29 September and 12 October — a scarce species in Middlesex and a new ten-kilometre square record. In 1994 Ray finally managed to catch a lackey *Malacosoma neustria* — the one remaining category 1A species that had not turned up in all the years he has been trapping here. The small emerald *Hemistola chrysoprasaria* was noted on 26 July, the white-pinion spotted *Lomographa bimaculata* on 14 June and the autumnal rustic *Paradiarsia glareosa* on 21 September — the first record for the Hampstead area since one at Bishops Wood (alas, now Bishops *Avenue*!), in 1898. Finally, a male pale oak beauty *Serraca punctinalis* came to Ray's trap on 13 May.

John Chainey informs me that the two trees in the grounds of The Natural History Museum, which for years have been home to a thriving population of the red-belted clearwing *Sesia myopaeformis* have been removed and so the moth is no longer extant here.

The merveille du jour *Dichonia aprilina* is often quite common where it occurs, but it has a decidedly local distribution in the London Area and is particularly scarce in the western portion. Martin Hough's find of an individual sitting on an oak trunk at Bayhurst Wood, Ruislip on 3 Ocotober 1993 is therefore particularly useful.

Finally for Middlesex, Anna Huges captured a rather fine melanic example of the marbled beauty *Cryphia domestica* in her garden trap at Enfield on 21 July 1994. The specimen, a female, was apparently freshly emerged and was more of less entirely blackish on the fore wings apart from having a light brownish sub-basal fascia and an area of lighter ground colour in the tornal region.

V.C. 24, Buckinghamshire

No records of significance have been received for this part of the London Area for the period 1992 to 1994.

APPENDIX

Important additions and corrections to *Larger moths of the London Area*

The following important corrections or additions should be made in *Larger moths of the London Area*:

173 *Apoda limacodes*: Now recorded from West Kent and at another site in Surrey in the post-1979 period. Add solid dots for tetrads TQ57B and TQ26K.

1658 *Cymatophorima diluta*: The solid dot in tetrad TQ57B should be an open circle. The species is not recorded for our part of West Kent in the post-1979 period.

1680 *Cyclophora punctaria*: Now recorded in North Essex in the post-1979 period. Add a solid dot in tetrad TL40P.

1691 *Scopula emutaria*: **Change status category from 7A (extinct) to 10 (uncertain)**. Recorded from West Kent in 1993, tetrad TQ57B (see above).

1788 *Rheumaptera cervinalis*: Recorded in tetrad TQ46W during 1993, new to West Kent in London.

1814 *Eupithecia plumbeolata*: Delete tetrad TQ57A which is not correct. Instead, add tetrads TQ57Q and TQ57R.

1823 *Eupithecia venosata*: Recorded from Middlesex for the post-1979 period. Add a solid dot in tetrad TQ28T.

1840 *Eupithecia subumbrata*: The solid dot in tetrad TQ56C is misplaced; it should be in tetrad TQ46C.

1841 *Eupithecia millefoliata*: Now recorded from Surrey in the post-1979 period. Add a solid dot in tetrad TQ26K.

1845 *Eupithecia pimpinellata*: **Change from status Category 7B (no recent records) to Category 4 (extremely local resident).**

1853 *Eupithecia dodoneata*: Now recorded for West Kent in the post-1979 period. Add a solid dot to tetrad TQ57B.

1881 *Trichopteryx carpinata*: delete tetrad TQ28S; this record relates to *Lobophora halterata*.

1885 *Abraxas sylvata*: **Category 4 status (extremely local resident) confirmed.** Now recorded at a secret locality in the London portion of West Kent.

1969 *Dyscia fagaria*: An earlier record from South Essex was omitted. Add: Forest Gate, 13 July 1915 (H. W. Fuller).

1976 *Sphinx ligustri*: Now recorded in North Essex in the post-1979 period. Add a solid dot in tetrad TL40P.

2009 *Ptilodontella cucullina*: Now recorded from Surrey in the post-1979 period. Add a solid dot to tetrad TQ36R.

2033 *Lymantria monacha*: The solid dot in tetrad TQ57B should be an open circle.

2131 *Xestia rhomboidea*: Recorded at Headley Warren, Surrey in 1994. Not mapped in *LMLA*.

2140 *Cerastis leucographa*: Two specimens from Epping Forest in the H. Mace collection at Parndon Wood Nature Reserve, Harlow, were accidentally omitted from the text on page 149. One was collected on 14 April 1906, the second bears no data. There are insufficient details to enable these to be allocated to a tetrad.

2179 *Panolis flammea*: Now recorded from North Essex. Add a solid dot in tetrad TL40P.

2191 *Mythimna turca*: add larval foodplants *Agrostis tenuis* and *Holcus mollis*. Delete misplaced solid dot in tetrad TQ27B; this should be in tetrad TQ17W (Richmond Park — see above). Add an open circle in tetrad TL50V (Stondon Massey, 20 July 1965 — missed earlier).

2235 *Lithophane semibrunnea*: Now recorded in North Essex in the post-1979 period. Add a solid dot in tetrad TQ17U.

2252 *Polymixis flavicincta*: Now recorded for Middlesex in the post-1979 period. Add a solid dot in tetrad TQ17U.

2255 *Eumichtis lichenea*: There is confusion in the South Essex records reported. Coxtie Green (first entry) is in grid square TQ59 and the second listed record is in fact a repeat of the first one. Both came from different sources and I failed to realize that they both related to the same record. So the second entry should be deleted and the first line of the species account should be amended so that it says there are only five, not six, records of this species in the London Area.

2281 *Acronicta alni*: now recorded in North Essex in the post-1979 period. Add a solid dot in tetrad TL40P.

2315 *Dicycla oo*: Now recorded from West Kent in the post-1979 period (see above). Add a solid dot in tetrad TQ36X.

2331 *Apamea unanimis*: Now recorded in North Essex in the post-1979 period. Add a solid dot in tetrad TL40P.

2338 *Oligia versicolor*: Now recorded in West Kent in the post-1979 period. Add a solid dot in tetrad TQ46W.

2371 *Archanara dissoluta*: The two Carshalton, Surrey records on 27 April 1990 are incorrect. They were actually made at Mitcham, Surrey on 27 July 1990. The position of the dots on the map does not require alteration.

2389 *Caradrina clavipalpis*: For some totally inexplicable reason this species is absent from the index of *LMLA*. Since the indexing was all done by a computer the reason for this lapse escapes me. Those wishing to amend their index should insert this species and note that it is featured on page 214. The colloquial name of pale mottled willow is similarly absent from the index.

2418 *Earias clorana*: The solid dot in tetrad TQ57B should really be an open circle as the species is not recorded here since 1970.

References

PLANT, C. W. 1989. A review of the Lepidoptera of the London Area for 1987 and 1988. *Lond. Nat.* **68**: 89–107.

PLANT, C. W. 1993. *Larger moths of the London Area*. London Natural History Society, London.

PLANT, C. W. 1994. A map of the surface geology of the London Area. *Lond. Nat.* **73**: 215–220, plus colour map.

Book reviews

The Oxford book of London. Edited by Paul Bailey. Oxford University Press. 1995. xviii, 377 pp. £17.99. ISBN 0 19 214192 9.

The Oxford book of creatures. Edited by Fleur Adcock and Jacqueline Simms. Oxford University Press. 1995. xii, 387 pp. £17.99. ISBN 0 19 214226 7.

These two books have been received just in time for a brief summary of them to be included in this year's issue of *The London Naturalist.* Both are packed with prose and poetry that have appeared down the ages and have become a large part of our literary heritage, and also new writings are included. In the short time available I have delved into both of them.

The Oxford book of London is divided into three parts: Part I begins at the end of the twelfth century, Part II covers the nineteenth century, and Part III the twentieth century. 'All great cities inspire great literature but no other city has so consistently stimulated the literary imagination as London. Over the centuries writers, poets, historians, artists, and simple observers have chronicled the life and growth of the capital from its humble beginnings to the teeming metropolis it is today. In his sparkling anthology Paul Bailey has captured the essence of its allure for visitors and inhabitants from the Middle Ages to the present day with wit, humour and pathos.' So runs the publisher's opening paragraph on the dust-jacket. There have been many fine books on London, both historical and romantic, and this one surely will join the classics. It takes us into the whole gamut of London life through Dickens, Jonson, Arnold (with his 'Lines written in Kensington Gardens' of which Elinor Wiltshire used his fourth verse to head her paper in last year's *London Naturalist*), Wordsworth, Shaw (Eliza Doolittle), Defoe, Evelyn, Pepys, buses, the Underground, the suburbs, street fairs, executions, churches, royalty, Epping Forest, beggars, pickpockets, the Blitz, Hampstead Heath, Jack the Ripper — the list is endless and I have just picked topics at random.

The Oxford book of creatures is another anthology covering many periods and countries. It ranges from Aristotle to Orwell, from Montaigne to Johnson, from Darwin to Miriam Rothschild, and to Beatrix Potter, Lewis Carroll, Thoreau and W.H. Hudson, to name just a few. About 250 creatures are covered from the least significant to the most majestic, fabulous, real or invented. The prologue opens with a passage from Charles Darwin's *Journal of researches,* and as we leaf through the book we come across 'The Lyon and the Gnat', 'Mollusc', 'Toad', Gilbert White's letter on hedgehogs, Eeyore, tapirs, dinosaurs, 'Song of the Death-Watch Beetle', 'The Wryneck's Nest', the song of the yellowhammer, 'The Osprey', 'The Lambs of Grasmere', Black Beauty, 'The Rats Underground', more from Darwin and White, Hudson, and Walter de la Mere. Animals are domesticated, befriended, hunted, eaten, and observed. Literature has captured so much of their lives and legends. Each chapter is headed with an apposite vignette, for example, Design is illustrated by a tortoise with its reticulated shell, Procreation by a nest with four chicks, and Workers by a smart red squirrel.

Both these books will make excellent presents for friends or relatives, or even better, for oneself. I have enjoyed dipping into them, albeit somewhat briefly at present, but I look forward to doing them justice in the weeks ahead.

K. H. Hyatt

Nathusius's pipistrelle *Pipistrellus nathusii* in the City: new to Greater London

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Abstract

This paper documents the occurrence in 1989 of a Nathusius's pipistrelle in the City of London. It represents the first record for Greater London and only the second record for the London Area.

Introduction

Nathusius's pipistrelle is a rare migrant and winter visitor to Britain from Continental Europe (Speakman et al. 1991), where it is known to be highly migratory with recorded movements up to 1,600 km (Strelkov 1969).

It has been recorded throughout much of western Europe, except the Iberian peninsula, and its distribution extends to the Urals and Caucasus in the former Soviet Union. The population is believed to be increasing in western areas and may be extending its range to the west (Stebbings 1988).

Identification

This species can only be separated from the pipistrelle *Pipistrellus pipistrellus* in the hand. The key diagnostic features are the dentition and wing structure.

The canines of Nathusius's pipistrelle are significantly taller than in the pipistrelle and the third incisor is not so obviously set back relative to the second incisor and the canine. The premolar behind the upper canines extends beyond the cingulum of the canine in Nathusius's pipistrelle.

The proportion of the fifth digit to forearm length, together with forearm length, is also useful to confirm identification. A ratio greater than 1.25 suggests Nathusius's pipistrelle, while most pipistrelles have a ratio of less than 1.25.

All Nathusius's pipistrelles measured in Britain up to the end of 1989 had a forearm length greater than 33.25 mm, although individuals on the Continent may have a forearm length of just 32 mm. The forearm of British pipistrelles rarely exceeds 33 mm.

These features, in combination, confirm the identification of a nathusius's pipistrelle.

The first Greater London record

On 29 September 1989, Tony Hutson of the Bat Conservation Trust and George Bemment of the Vincent Wildlife Trust were called to a bat which had been discovered on the wall of the National Westminster Bank headquarters building in the City of London.

This bat was identified as a male Nathusius's pipistrelle. The following biometrics were obtained: weight 6.2 g, forearm 33.8 mm, fifth digit length 42.9 mm, and ratio of fifth digit to forearm of 1.27.

Past records

The Nathusius's pipistrelle was first recorded in Britain in 1969 (Stebbings 1970). Records of the species have been analysed (Speakman et al. 1991) for the period up to the end of

1989. A total of 21 records for Britain, including the Channel Islands and North Sea oil rigs, has been validated.

The figure includes the only London Area record available to Mickleburgh (1987) in his review of bat distribution. This involved a male captured in the Lea Valley, Hertfordshire on 17 August 1978. The biometrics obtained were: weight 7.5 g, forearm 33.7 mm, fifth digit length 43.2 mm, and ratio of fifth digit to forearm of 1.282 (Banks et al. 1983). It also includes the City of London record reported in this paper which, as well as being a first for Greater London and the second in the London Area, was only the twentieth record in Britain.

Future occurrences

Of the 21 British records to the end of 1989, all except two have been found in the years since 1985. Although only seven have occurred on the mainland, the enhanced number of sightings is correlated with the higher profile of bats and rise of the bat conservation movement during the 1980s.

With a greater awareness of the occurrence of bats from the Continent and a better knowledge of identification criteria, the number of British records will probably continue to rise. If the western population is increasing as suggested by Stebbings (1988), this can only enhance the chances of more records in Britain.

There is no reason to suppose that, given continued levels of mammal recording in the county, the London Area will not host more individuals in the future. It will be important, however, to respond to all reports of grounded bats, especially around May and September when the majority of past records have occurred, in order to improve the chances of finding further Nathusius's pipistrelles.

Acknowledgement

The author is grateful to Tony Hutson for agreement to publish a note of this new record.

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The jewel beetle *Agrilus pannonicus* in the London Area

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Abstract

The distribution of the jewel beetle *Agrilus pannonicus* (Piller & Mitterpacher) (Buprestidae) within the London Area was surveyed in 1993 and 1994 by finding larval mines and adult emergence holes in oak *Quercus* spp. trees. The insect was found to have become widespread in the recent period. despite having been very local and rare formerly. Habitat changes and the beetle's ability to colonize new areas, as well as previous lack of recording, account for this current status.

Introduction

A large number of saproxylic (dead wood-feeding) beetles and flies are listed as scarce and endangered in the *Red Data Book* (Shirt 1986). In many cases they can be considered as relict fauna left from the high forest which dominated our countryside since the last ice age (Hammond and Harding 1991). Many species now live in isolated populations in what are today islands of ancient woodland and show little tendency to colonize newer habitat. Ancient pasture woodland in lowland Britain, usually in the form of deer parks, contain old pollard trees especially rich in saproxylic invertebrates; examples in southern England are Windsor Park, Epping Forest, Richmond Park and the New Forest. It is the habitat continuity in space and time provided by the parks or forests and within ancient trees on these sites which favours this specialized fauna and the reason, in a changing landscape, that they are local and often endangered.

Harding and Rose (1986) compiled lists of beetle and lichen indicators of ancient pasture woodland exclusive to these sites (or nearly so). The concept has been developed by Harding and Alexander (1994) to aid site evaluation through calculating an 'index of ecological continuity' from beetle lists.

Agrilus pannonicus was one of the 195 species given indicator status—grade 2 (on a 1 to 3 scale) by Harding and Rose. It is of interest to study the ecology and survey the current distribution of rare insects so that their habitat is managed appropriately. *A. pannonicus* was amongst the beetles and other invertebrates listed in Plant (1991) in a survey of Ken Wood and North Wood, parts of Hampstead Heath. At that time the insect was only known from Hampstead in this part of London and appeared to have a 'stronghold' there, as records went back to the nineteenth century (Foster 1987). Elsewhere in London there is an old record from Bishop's Wood, Batchworth, Hertfordshire (in 1954) and Darenth Wood, Kent, pre 1930 (Allen 1973). In modern times it was discovered by P. M. Hammond at Richmond Park in 1984 (Allen 1988) and also at Bookham and Ashstead Commons and Bushy Park by Menzies (1990).

Possible ancient woodland sites and old (rather than ancient) trees containing habitat for saproxylic invertebrates in London are many, left over from the pre-Victorian land-use pattern. The Nature Conservancy Council published an inventory of 191 ancient woodland sites in Greater London (Spencer 1986). These were identified from early maps, then tree species and associated ground flora were surveyed, but invertebrate indicators were not included. The woods are now scattered across the urban landscape, but old field boundary trees in the suburbs and formal parks with old trees contain dead wood of possible conservation significance.

This paper reports on a survey of *A. pannonicus* in dead oaks around London. The current distribution and various observations of this insect's biology allow some comment on its habitat requirements and value as an ancient woodland indicator.

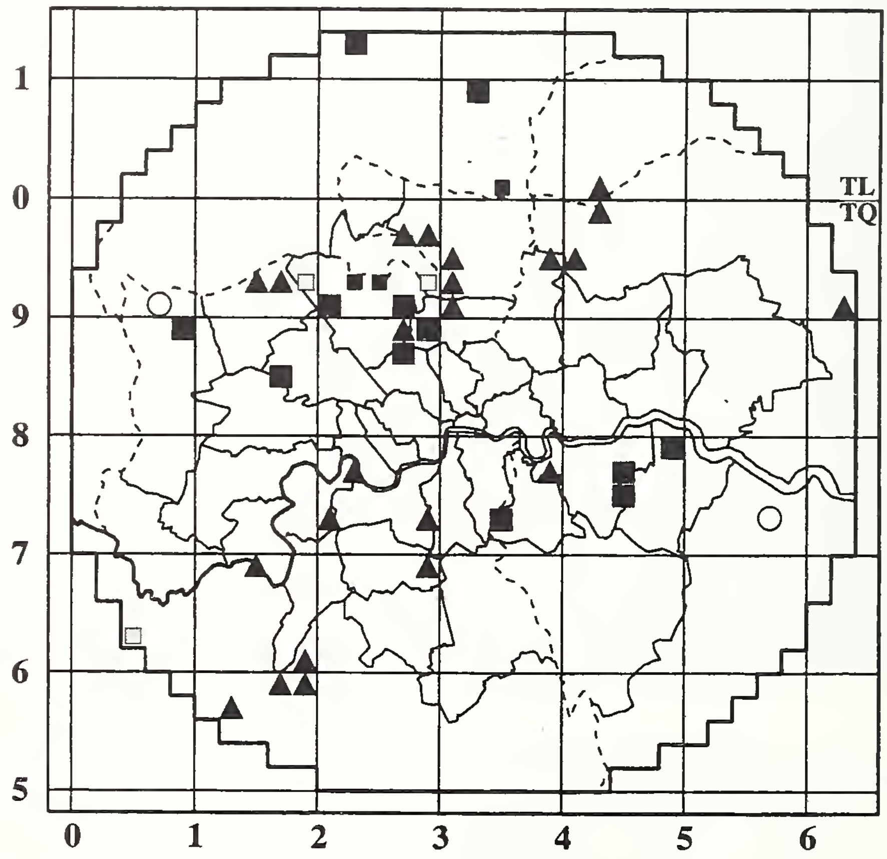
Methods

The larval feeding site of *Agrilus pannonicus* is between the thick bark and wood of large dying oak trees (Bily 1982). After pupating, adults emerge in summer, leaving characteristic D-shaped flight holes of approximately 3 to 4 mm diameter. The holes are generally in the scale of the bark and the orientation of the D is random. In trees that have lost their bark, larval mines can be detected across the surface of the timber. These characteristics permit non-destructive and all-season survey.

Dead and dying oaks, felled trees and stumps in woods, commons and parks and those situated on field boundaries around London were searched specifically for emergence holes. A scattering of accessible sites was chosen to establish the extent of the insect's range. At some sites small bark samples were levered off likely stumps and dead trees not yet bearing flight holes, to find larvae or pupae and to rear adults. The bright turquoise adults were reared successfully from certain bark samples, confirming the identity of the emergence holes and larval mining. Live adults were also seen on oak trunks in the field on a few occasions and were occasionally observed in bark, trapped in emergence holes.

Results and discussion

Agrilus pannonicus was recorded from 33 sites. This resolves to 41 tetrads on the standard LNHS map (Figure 1), which includes 12 modern records from the literature and those supplied by K. Alexander, national recorder for buprestids, T. James, Hertfordshire recorder, S. Burford and A. Samuels. The distribution map shows *A. pannonicus* has recently inhabited dead oaks right across the 40-mile diameter recording area, and occurs in several tidy urban parks, coppice woodland, old boundary trees, on commons and in Epping Forest, a



Tetrad key:
- ▲ commons, parks and pasture woodlands.
- ■ ancient coppice woodland.
- ▪ boundary trees.
- □ other modern (post 1985) records.
- ○ old (pre 1955) records.

FIGURE 1. Distribution of *Agrilus pannonicus* in the London Area.

former deer-hunting ground. The characteristic emergence holes that simplify surveying were not mentioned in older literature such as Fowler (1890), nor were they included by Levey (1977). The adult beetle is very elusive and this, in itself, would lead to under recording. Coleopterists also tend to visit good sites repeatedly rather than survey extensively. However, there has been an increase in records of adults in southern Britain as a whole, and Smith (1994) even found adults on buses in north London on two occasions. Hackett (1995) commented on Smith's observations. Thus the distribution found in this survey is probably due to recent colonization of new sites, rather than simply due to under recording. A local population increase which may well hold for a wider area is indicated by the numbers of host trees, for instance over 30 were recorded in Queen's Wood, Haringey, many bearing over a hundred emergence holes, and some of the dead host trees date from the October 1987 storm. By contrast, Allen (1973), when reporting a find of *A. pannonicus* at Windsor, stated that at that time there was doubt as to whether this species was extinct in Britain. The current survey was not exhaustive and the peripheral areas of London in north-west Kent, Hertfordshire, Berkshire and Essex were not explored. There is much scope for more recording by LNHS members.

Trees in ancient woodland, particularly oak standards in neglected coppice with tall uniform trunks, have recently been dying off in some numbers. The 1987 storm damaged some trees and others had to be lopped or felled to make them safe. Hot drought summers coupled with stress due to the lack of harvesting or understorey management and air pollution (Winchester and Hawksworth 1991) may be contributing to the slowing of growth and dieback of oak trees. For example, over 60 dead oaks stand in Queen's Wood, Haringey, an area of 21 hectares, and about half bore *A. pannonicus* emergence holes, indicating this a good habitat for this species. Trees covered in ivy or affected by honey fungus *Armilleria* spp. were not used as hosts. Other oak trees were not infested for unknown reasons.

Some woods which I searched for this beetle had very few dead oaks, such as Bostall Woods. Other parks, such as Hyde Park, had no standing dead oak or timber on the ground for hygiene, safety or aesthetic reasons. I could not find emergence holes or signs of larval galleries in sweet chestnut *Castanea sativa* L. although this is a listed host on the Continent.

The larva breeds under the bark of dying and recently-dead oak trees. Galling on the surface of the timber was sometimes but not always observed to have occurred and since this indicates a response by the living tissues of the tree, the observation corresponds to the ambiguities in the literature on this buprestid, as noted by Bowdrey (1994).

Some trees had been felled in an effort to make woods safe to walk in, such as Highgate Wood, and several records derive from such stumps. Interestingly, no emergence holes were found in the adjacent severed trunks, unless these had been standing and dead already. The moisture or drying downwards of the sap under the bark seem to be important to larval feeding. The total time a standard tree can act as a host as it dies may be short. An oak stump remaining from a tree felled in a small coppice area in Queens's Wood in February 1992 was found to contain larvae but no emergence holes on 5 May 1993. Four adults subsequently emerged from bark samples taken into culture, indoors on 28 May 1993. This confirms that pupation takes place in the bark and that development can be completed in one year, since I am informed by David Bevan, Haringey conservation officer, that the tree in question was healthy at the time of felling. Bily (1982) states that larval development in Fennoscandia takes two years. Returning to the same stump on 26 April 1994, other large *Agrilus* larvae were still present, indicating development may indeed take two years, or that a second generation was in progress. However, the total time a dying standard tree may be suitable as a host for this beetle, given that it is associated with sap between the bark and the wood, is short, perhaps three years at the most, and larvae were never found in dead trees once the bark had become loose. The insect clearly moves from tree to tree approximately each generation when the host is a dying standard tree. The short period of host suitability would not apply to pollarded trees, in which the timber and bark have a more diverse age and physiological structure. Observations at Richmond Park in July 1993 showed emergence holes in a patch of bark on one side of a tree that was hollow, but still growing at the top. The frequently temporary nature of this beetle's larval habitat, compared to a species which breeds in rotting heartwood (which may be present in one spot for a century or more), would lead it to have evolved good dispersal powers. This is consistent with observations of Southwood (1977) that habitat temporariness is the main templet of dispersal behaviour. The ability of this beetle to colonize new habitat suggests it is not a good indicator of ancient pasture woodland as given by Harding and Rose (1986). Several of the indicator species named therein have been found to occur in dead wood in other habitats and are therefore more general woodland indicators. The dispersal flight capacity of *A. pannonicus* adults is not known, but in theory it would be possible to infer this by finding beetles in isolated pockets of woodland, preferably eighteenth or nineteenth century secondary or plantation woodland. No such sites are known to me.

A continued supply of dying oaks is clearly the main requirement for this insect's long-term survival. Age structure, health and mortality factors of the current stock of trees, as well as regeneration within oakwoods are the areas of concern.

Acknowledgements

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Survey of Bookham Common

FIFTY-THIRD YEAR

Progress Report for 1994

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Management work on the Bookham Commons (Ian F. Swinney, National Trust warden)

At the risk of being repetitive, the management tasks for the Bookham Commons have followed along the same principles as in 1993: the main aim being to preserve a wide range of vegetative environments by clearing scrub to maintain open grassland to the south and west (Central, Bayfield and Western Plains), and selectively to thin parts of the woodland, thus letting light into some of these densely shaded areas to encourage ground vegetation and the fauna associated with it. Continuity of such practices is essential for the long-term survival of an optimal range of wildlife species, and these are detailed in the management plan, approved by English Nature.

Many of the problems concerning the maintenance of satisfactory population levels of plant and animal species are concerned with the total area of a particular habitat, and the degree of isolation from adjacent natural habitats. The total size of the property is important, and although the Bookham Commons may seem an extensive area, viewed in perspective it nevertheless is only a relatively small 'dot' surrounded by increasingly urbanized and heavily agriculturized landscape that represents an effective barrier to the spread of the less-adventurous species. During the first half of the present century there existed many natural 'corridors' that created effective linkages with adjacent wildlife areas such as Ashtead, Epsom and Ranmore Commons. Can the modern Bookham Commons area still be expected to sustain viable populations of wildlife in face of increasing ecological isolation, or has the opportunity for mobility, and hence replenishment of species following inevitable local losses due to temporarily unfavourable conditions, gone for ever? Here, perhaps, is an argument favouring the 'assisted' reintroduction of certain species. Approval for any such operation is unlikely to be forthcoming at present, and should, especially on SSSIs, have the consent of English Nature. Reintroductions do, however, take place from time to time, and the importance of keeping The National Trust or the LNHS informed must be emphasized.

Management has largely been concerned with selection of the best traditional techniques: partial grazing, rotational selective tree and scrub clearance, rotational clearing of ponds and watercourses, which, when undertaken against a background of natural recolonization enables survival of the greatest variety of representative species for posterity. During 1994 further clearance work (glade restoration) was undertaken, with the help of many volunteers, on Glade Path and Eastern Plain. A major clearance on Bayfield Plain at a time of high rainfall has left a rather bare area, but clearance of over-mature scrub and areas with a high incidence of even-aged trees such as birch and sycamore (while retaining some clumps), has already enabled some of the grassland species, such as devil's bit scabious, to recolonize.

Further support for this policy has been the regrowth of petty whin and other interesting heathland species following clearances undertaken in 1993.

Recommendations made in an independent 1994 report on the ponds and wetlands are being considered by the Bookham Commons Local Committee, the National Rivers Authority and the London Natural History Society, in an attempt especially to improve the water quality of the Isle of Wight Pond. Caution is being taken with regard to the other ponds as they have individual characteristics and the requirements of individual species (e. g. the Odonata) differ and may need careful consideration. The advice of many experts and authorities is therefore being considered before any major operation is undertaken.

The National Trust management thanks the naturalists of the London Natural History Society's Bookham Common Survey Team for their continued interest and support which as made this area one of the best-recorded and most interesting in our countryside. The information produced by the survey is extremely valuable for enabling optimal management to be undertaken.

Vegetation (Ken Page)

The most remarkable botanical event at Bookham during 1994 was the discovery of the hybrid agrimony. This cross between *Agrimonia eupatoria* and *A. procera* is apparently extremely rare in the British Isles. Professor Stace states in *Hybridization and the flora of the British Isles* that it has been recorded once, in Northumberland in 1949. A full account of the Bookham plant will appear in the next survey report.

Progress is being made with a survey of the microspecies of *Rubus fruticosus*; about twenty have so far been determined by experts. One of these, *R. formidabilis*, is considered to be a local endemic—known only from Surrey! It is our intention to establish the distribution of all the microspecies in each of the botanical divisions of the Common.

Plants that have recently been seen here for the first time include fritillary *Fritillaria meleagris*. Three of the six plants produced flowers. *Lemna minuta*, an American duckweed which is spreading rapidly in southern England, has been observed in some of our ponds. A most unwelcome addition to the flora is the giant hogweed *Heracleum mantegazzianum*, appearing at intervals along the track sides; clearly it has been introduced deliberately.

Butterflies (Ken J. Willmott)

The poor spring weather of 1994, with twice the previous year's May rainfall, was adequately compensated for by excellent weather in July.

One interesting feature of the year was the established sightings of the white admiral *Ladoga camilla*, probably a response to the felling of one hundred and fifty oak trees during recent years, to encourage plant and animal activity at ground level, within areas favoured by this handsome insect. Two twenty-minute 'frequency counts', made on 30 June and 3 July, gave figures of 31 and 21 compared with 20 for 24 June 1992 and 28 for 29 June 1993. These counts were undertaken by KJW along the length of the same ride: although such counts depend upon activity as well as population density, they do suggest that tree thinning has been well tolerated and may have been of benefit to this species. Unlike 1993, abberration was notably absent this year. Though eight eggs were found on 7 July, and a first-instar larva on the 17th, egglaying activities were still in progress on 20 July.

First appearing on 30 June (NW edge of the Common) the purple emperor *Apatura iris* performed brilliantly for the annual NT 'butterfly walk' (9 July), a fine male flying around the party not far from the Tunnel Car Park and much to the satisfaction of the photographers, even settling upon several members! On the same morning several males were also seen in the vicinity of Merritt's Cottage, one settling on a pile of logs within sight while members of the LNHS were having morning coffee on the lawn about 11.15.

The red admiral *Vanessa atalanta* once more established its annual 'territory' below the purple emperor 'master oaks'. A single silver-washed fritillary *Argynnis paphia* was encountered on the Common, origin unknown. The Dutch elm disease and its effects on the white-letter hairstreak *Strymonidia w-album* continue to give cause for concern. It was not as easy to find the larvae or pupae as it was in 1993: the butterfly was not seen near Bookham Grange Hotel on 26 June, the elms being badly affected, whereas the Bank's Common colonies continue to flourish, a female being observed egglaying on wych elm *Ulmus glabra*, which is less susceptible to the disease, on 3 July. Quite a number of the butterflies were also seen flying around the elms near the railway station on 9 July.

The purple hairstreak *Quercusia quercus* was distinctly reduced in numbers, little more than half a dozen being seen per visit instead of the uncountable numbers of recent years. Several larvae found in an interception trap placed under an oak near Merritt's Cottage during late May suggest that the fully grown larvae may purposely fall from the upper branches to pupate amongst litter on the ground.

The numbers of peacock *Inachis io* and small tortoiseshell *Aglais urticae* larvae on stinging nettle were disappointing, but the comma butterfly *Polygonia c-album* was present in good numbers during July. Most of the grass-feeding satyrids were present in average numbers, but the speckled wood *Pararge aegeria* and ringlet *Aphantopus hyperanthus* both became very numerous in the early part of July.

The splendid larva of our second imperial species the emperor moth *Saturnia pavonia* was found by the roadside near the Isle of Wight Pond on 17 July.

Coleoptera, Orthoptera, and other insect orders (Ian S. Menzies)

The unsettled weather proved an obstacle to fieldwork during the summer of 1994, however there were spells of good weather in June and July that enabled some observations to be made.

Larvae of the lilac beauty moth *Apeira syringaria* were noted from honeysuckle, South Eastern Wood on 11 March, and of the poplar kitten *Harpyia bifida* and chocolate tip *Clostera curtula* from poplar in the Arboretum on 17 September. Two examples of the longicorn beetle *Judolia cerambyciformis*, a wasp mimic, were found within 200 yards of Merritt's Cottage on 11 July: this species is apparently new to Bookham. Also on the same day *Abia sericea*, an attractive sawfly with clubbed antennae, was seen flying around devil's bit scabious on the Eastern Plain.

Both cone-head bush crickets *Conocephalus dorsalis* and *C. discolor* were found to be holding their own in the Western Plain site in 23 July, though they were not noted from other areas where they had been seen in previous years. Again Roesel's bush-cricket could not be located although this species was seen in several adjacent Surrey sites.

Birds (Ron Kettle)

Only five visits—in April and May—were made to Eastern Wood for the Common Birds Census because Ron Kettle developed a bad attack of shingles in late May which incapacitated him for the rest of the year. Bad weather conditions earlier had also created some difficulties for fieldwork so that valid comparisons with findings from previous years are not possible. However, the BTO was asked to analyse results and found 'evidence to suggest that most species were present in similar numbers to the previous year'. Certainly it can be said that blackbird *Turdus merula* numbers remain low and that coal tit *Parus ater*, marsh tit *Parus palustris* and chaffinch *Fringilla coelebs* had no more than one territory each.

Grey herons *Ardea cinerea* occupied five or six nests in the two heronry groups during early April, but the subsequent wet and windy weather appeared to have taken its toll, leaving only two or three nests with young by mid May.

Canada geese *Branta canadensis* reared three goslings and a mandarin duck *Aix galericulata* four ducklings on the Isle of Wight Pond, so unfortunately these introduced aliens bred successfully! Sparrowhawks *Accipiter nisus* were not so much in evidence, but a hobby *Falco subbuteo* was seen flying over in September, no doubt on passage. A woodcock *Scolopax rusticola* was roding on 16 May and also reported later in the summer. At least one stock dove *Columba oenas* was singing in the woodland, and more than two turtle doves (!) *Streptopelia turtur* on the plains. A kingfisher *Alcedo atthis* was seen more than once on Western Hollow Pond in June.

Up to six nightingales *Luscinia megarhynchos* were heard singing. An unusual if not surprising record was that of a sedge warbler *Acrocephalus schoenobaenus* singing on 8 May, but not reported subsequently. Lesser whitethroats *Sylvia curruca* were scarce, but common whitethroats *Sylvia communis* plentiful, with over 10 singing males. A wood warbler *Phylloscopus sibilatrix* sang in the SE corner of Eastern Wood on 29 April. With redpolls *Acanthis flammea* generally declining, it was good to know that two were seen in the trees near the Isle of Wight Pond on 17 November.

An appeal in the *Ornithological Bulletin* for members to visit the Common and make observations on the rich bird life of the scrub area drew only one response, from an inexperienced person who has now left London—a sad reflection on the willingness of LNHS bird-watchers to make a contribution to surveys like this. However, three Surrey Bird Club members agreed to help and provided very useful records, and I am therefore grateful to Nick Murphy, Gary Trew and Peter Crook, on whose observations most of this report is based.

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Erratum

On page 177 of *The London Naturalist* **73** (1994), the name *Hydrochus nitidicollis* should be *Hydrochus angustatus.*

The present distribution of Guernsey fleabane *Conyza sumatrensis* in the London Area

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The introduced Guernsey fleabane *Conyza sumatrensis* (Retz.) E. Walker has increased more rapidly in the London Area than any plant species at least since Oxford ragwort *Senecio squalidus* in the 1930s and 1940s (Kent and Lousley 1953: 158–160). The earliest record was in 1983 by Palmer (1983) who found it near Blackfriars, where it still occurs. In 1984 it was found by the late Rupert Hastings on Rainham Marsh and by Brian Wurzell in a number of localities by and near the canal system from Kingsland to Bromley-by-Bow. In 1985 several more sites were discovered, mostly by Mr Wurzell, including two sites in urban parts of v. c. 17 (Surrey) and a tip at Swanscombe with one plant found by Geoffrey Kitchener and John Palmer. In all there were then records from sixteen tetrads in the area, twelve of them in TQ38, shown on a map by Burton (1986). However, 1986 and 1987 added only three new localities, all with only one or at most two plants; a tip at Greenhithe not far from Swanscombe, a soil heap in a cemetery at Long Ditton in Surrey a long way from the rest, and the Parkland Walk in north London.

Clearly there was a second invasion after the first, perhaps borne on the catastrophic southerly gale of 16 October 1987, for in 1988 there were nine additional records including three from Kent well to the south of the main built-up area of London, and in 1989 twenty, extending the known range north to Enfield. It has been increasing rapidly ever since. In 1990 David Bevan (pers. comm.) reported that it was 'racing up Parkland Walk', and in 1991 he was finding it 'in all the coppices, now throughout Haringey'. Wurzell (1992) described how it had got to the gates of Kew Gardens, but records were still 'lacking from Surrey west and south of Kew' and 'from deeper Kent to the south coast'. Neither statement is true now, but only the first concerns us. In 1992, too late for Wurzell's publication, Barry Phillips and Ken Page found it at Addlestone a lot further west than Kew, and subsequent records have taken it further south in Surrey as well. This can be seen from a study of

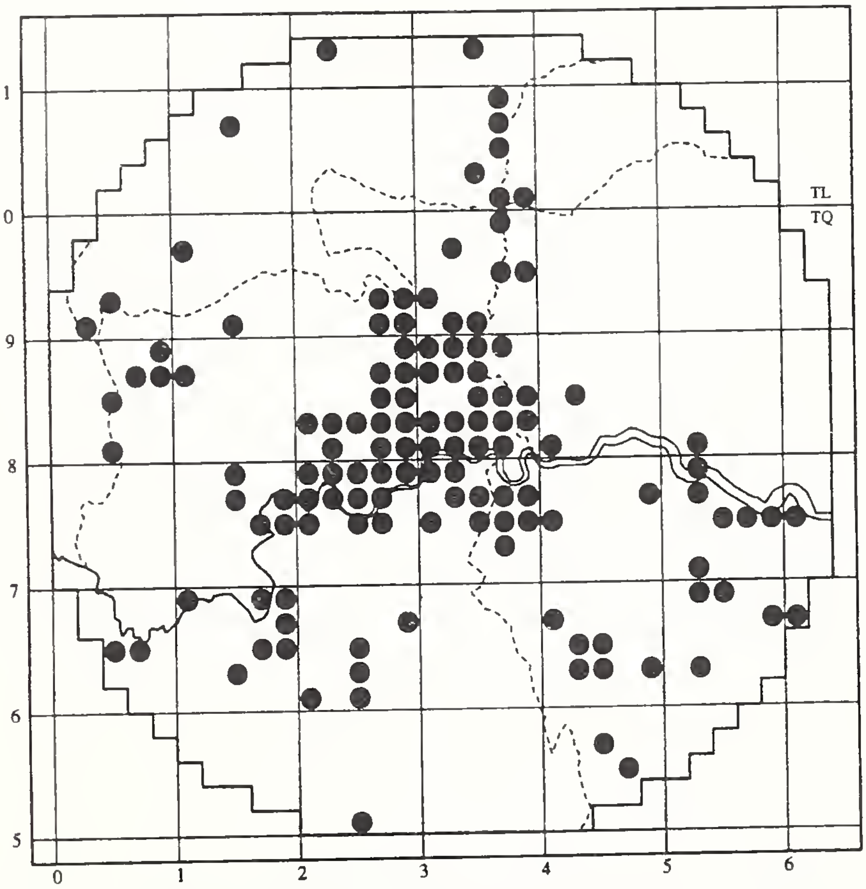

FIGURE 1. All records of *Conyza sumatrensis* for the London Area to the end of May 1995.

Figure 1, which shows all records received up to the end of May 1995. What is not clear from the map is to what extent the gaps on it genuinely indicate the absence of the plant. Certainly the band of records up the Lea Valley is real; Ann Boucher who contributed most of them has also botanized extensively in the area further west. The scarcity of records in south-west Middlesex is probably also real, and matches the history of *Senecio squalidus* L. in the area (Kent and Lousley 1953). The gap around Croydon is less convincing. The one record from TQ25, referring to a single large plant in a garden in Reigate in 1994, is characteristic of the pioneer stage of colonization of the species already evidenced from Parkland Walk. The isolated records around the north edge of our area are all from towns (Welwyn Garden City, Hertford, Ware, St Albans) and it is not surprising that there are no records from the rural parts of Essex in our area, but in any case I do not know that anyone has looked for it there. Wurzell (1992) said it was 'prolific and pestilential throughout Docklands', a vague description which certainly covers more tetrads than those on the map with more specific records. In the area where it is most heavily concentrated it is indeed extremely common. In five weeks in 1994, Geoffrey Kitchener looked for *Conyza sumatrensis* in all 238 named roads and passages in the WC1 postal district, and found it in 236, the exceptions being dark and narrow foot passages without any plant life. Without being so exhaustive, I found it to be almost as ubiquitous in WC2.

It may have been overlooked in places because of an expectation that it would be found in the same sort of urban or ruderal habitats favoured by the more familiar Canadian fleabane *C. canadendis* (L.) Cronq. Stace (1991) gives the habitat of *C. sumatrensis* as 'waste and rough ground in protected sunny spots', and the early localities certainly conformed to this. However, it soon showed a capacity for spreading into woodland, especially after storm damage or coppicing.

There does not seem to have been any difficulty in identification of *C. sumatrensis* vis-a-vis *C. canadensis*, but the presence of a third species in London, Argentine fleabane *C. bonariensis* (L.) Cronq., has caused problems. Palmer's first record was referred to the latter species, but the figure in his publication (1983) makes it clear that *C. sumatrensis* was meant. *C. bonariensis* is known in London from Somers Town and nearby (Wurzell 1994). This reference contains useful drawings of all three species, but for a key it is necessary to go to Wurzell (1992), Burton (1985), or, of course, Stace (1991). None of these mentions the characteristically brittle stems of *C. sumatrensis*. The phyllaries in this species can be strongly pubescent all over, or have the pubescence confined to a median strip.

Acknowledgements

My thanks are due to the following who have supplied records: K. J. Adams, D. Bevan, Mrs A. M. Boucher, P. J. Ellison, R. S. R. Fitter, C. G. Hanson, the late R. B. Hastings, J. B. S. Hodge, P.C. Holland, Miss P. A. Hyde, G. D. Kitchener, The London Ecology Unit, Mrs S. Luce, Mrs E. Norman, K. W. Page, Miss H. K. Pallan, J. R. Palmer, B.Phillips, Dr M. C. Sheahan, Mrs O. E. Slattery, Mrs J. E. Smith, Miss B. Villiers, Mrs E. Wiltshire and B. Wurzell.

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Botanical records for 1994

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Summary

Records for 1994 (and some earlier) from the area 20 miles around St Paul's Cathedral are presented in the context of botanical recording activity in this area generally. They include *Minuartia hybrida* in Kent, *Carex filiformis* in Surrey, *Orchis morio* in Essex and *Argemone mexicana* in Middlesex.

Introduction

This paper is in an uninterrupted series which was started by Lousley (1945*a*, *b*) and continued by myself after his death. In fifty years a great deal has changed, and it seems appropriate now for me to present the most recent crop of records in the context of the current situation of botanical recording. At the end of the Second World War, there was no national botanical recording society in Britain and very few local natural history societies. The London Natural History Society (LNHS) was therefore unusual in its activity of collecting and publishing botanical records, and was able to do so, in an area of its own choosing, a circle of 20-mile radius centred on St Paul's Cathedral, without fear of treading on anyone's toes.

The present situation is very different. Nationally, The Botanical Society of the British Isles (BSBI) has a recorder appointed to each vice county, the vice-county being the division of the British Isles, excluding Ireland, set up for his own purpose by Watson (1873). The recorders are used as sources of information on the flora of their vice-counties in national botanical surveys. The *Atlas of the British flora* (Perring and Walters 1962) is a collection of distribution maps resulting from such a survey and produced by the BSBI, which has announced its intention of producing a new atlas at the end of the present century.

The vice-counties in the LNHS recording area were listed and their boundaries described by me in a recent paper (Burton 1994*b*). The state of botanical recording in these vice-counties is described in the following paragraphs.

V.C. 16, West Kent

The Kent Field Club published the *Atlas of the Kent flora* (Philp 1982) following a survey in 1971–80. Eric Philp is still the BSBI recorder for East and West Kent and has announced his intention of producing a flora rather than just an updated atlas, which will be based largely on his own observations, at the end of the century. The new work, like its predecessor, will not cover those parts of v. c. 16 which are in London boroughs. In these, the LNHS is not quite alone in publishing botanical records, as the Orpington Field Club also has a section of its annual report devoted to them, form an area including all of and extending beyond the borough of Bromley. Highlights of their 1994 records include the first appearance in this part of London of the greater yellow-rattle *Rhinanthus angustifolius* in the grassland of Spring Park Woods, West Wickham, to which it had presumably somehow been accidentally introduced from Surrey sites on the Corporation of the City of London's hay-cutting machinery, and yellow bird's-nest *Monotropa hypopitys* in Darenth Wood. Their recorder Mrs J. Pitt also told me that she had found a lot of common cudweed *Filago vulgaris* among the (actually less rare) small cudweed *F. minima* on a rabbit-gazed slope outside Farningham Wood.

Some 1994 records form other sources in the London Area have also reached me. Barry Cheal, the London Wildlife Trust's local contact for the borough of Bexley, told me about blue sow-thistle *Cicerbita macrophylla* at East Wickham open space, which the borough council stopped gang-mowing in 1988, I hope as a result of persuasion from his group; there are scattered records of this ornamental species from London, but they are all from other boroughs. John Archer sent me photographs of an orchid he found in the communal flower-bed of a housing estate in Blackheath, which I had expertly determined as early marsh-orchid *Dactylorhiza praetermissa*; the referee, Ian Denholm, justly comments on the totally unexpected nature of this occurrence and suggests that someone may have introduced it deliberately, unlikely though that may seem. Early in 1995 Mr Archer had found fruiting plants of henbane *Hyoscyamus niger* by the railway south of Grove Park Station, and he reported to me Mike Prime's discovery of house holly-fern *Cyrtomium falcatum* and other ferns in St Mary's churchyard, Ladywell. In Ladywell cemetery K. White found a few stunted plants of grass vetchling *Lathyrus nissolia*. D. J. Nicolle's records from Bexley include rue-leaved saxifrage *Saxifraga tridactylites* from cracks of a wooden fence at the station, a most unusual habitat for this species, one leopard-plant *Ligularia dentata* on the river bank at Hall Place and weasel's-snout *Misopates orontium* and stinking goosefoot *Chenopodium vulvaria* as allotment weeds, the last accidentally introduced by the allotment holder. At our meeting to Oxleas Wood on 16 June I found roadside plants of sea mouse-ear *Cerastium diffusum* among the buck's-horn plantain *Plantago coronopus*; I have also had this from a similar locality by the A20 on Farningham Hill and wonder if it is to be reckoned as the least conspicuous of the maritime plants occurring on roads treated with de-icing salt. Our meeting of 30 July was to Crofton Heath in the borough of Bromley, and turned up lady fern *Athyrium filix-femina*, soft shield-fern *Polystichum setiferum* and a presumably bird-sown stranvaesia *Photinia davidiana*, not previously known to the leader R. G. N. Bird, who has produced a very comprehensive plant list for this area summarizing many years of observation.

Outside the London boroughs, our area overlaps with the Kent Field Club's for about 260 km^2. This zone includes both my own home and those of our active members J. R. Palmer and G. D. Kitchener. My own best record was certainly the substantial population of fine-leaved sandwort *Minuartia hybrida* which I found on Eynsford Castle, the first West Kent record this century; factors which may have favoured the appearance of this and the great increase in *Saxifraga tridactylites* are the cessation of spraying to the mediaeval flint walls and disturbance caused by maintenance work on them in 1993. Others who went to admire my discovery reported also seeing prickly poppy *Papaver argemone*, which in my excitement I had missed. Late in the year I found a field near Shoreham with plentiful cornflower *Centaurea cyanus*; it was only when I went back early in 1995 that it became clear that this may have been introduced as an impurity in grass seed, none of which had germinated by the time the cornflowers were blooming. Mr Kitchener's list includes fifteen plants of fly orchid *Ophrys insectifera* near Halstead, on chalk as usual in our area but in an unusually open site, and two patches of Siberian iris *Iris sibirica* in a wet place in a meadow at Otford. This was pointed out in fruit to joint meeting of the Wild Flower Society and the BSBI which he conducted on 16 July, at which I discovered four plants of knotted hedge-parsley *Torilis nodosa* as a street weed nearby. Turkish iris *I. orientalis* was among the more unusual plants seen on the meeting to Northfleet and Swanscombe which he led jointly for us and the Kent Field Club on 25 June.

I depend upon word of mouth or careful reading of published sources to hear of unusual records by non-members of LNHS in this zone, of which we had an important example in 1994, early gentian *Gentianella anglica* found in downland near Shoreham by Mrs Sue Buckingham with an adult education class. The only other record of this rare calcicole from the Kent part of our area dates from 1946 and was of a single plant at Kemsing on the edge of our area. A visitor, Mrs J. Hunnybun, is reported to have been shown six-stamened waterwort *Elatine hexandra* in Sevenoaks Wildfowl Reserve which is just in our area (Forster 1995); if this is correct, which I doubt, it will be the first record of the species from Kent or from our area.

V.C. 17, Surrey

A Surrey Flora Committee was set up in 1957 and its secretary has been Mrs J. E. Smith since the retirement of Mrs Barbara Welch in 1962. Mrs Smith has also been the BSBI recorder for the vice-county since 1979, following the death of Dr C.T. Prime. Although its original product (Lousley 1976) was published many years ago, the Committee remains in existence as a botanical recording society, retaining ownership of the records. There has been one supplement to the flora already (Leslie 1987) and a substantial update to the supplement published in 1994. Mrs Smith sends members a newsletter every year with an account of the previous year's meetings, an account of botanical conservation activities in the county and a compilation of records. For her services to conservation, she was awarded an MBE in the 1994 New Year's honours list. From the 1995 newsletter, it can be seen that they overlap with the LNHS not only in area (about a third of the county is within our circle) but also to some extent in membership. The rest of this paragraph consists of 1994 records extracted from it. In Thorpe hay meadow, a carefully conserved relic site, Barry Phillips found several plants of downy-fruited sedge *Carex filiformis*, which had been thought extinct in the London Area and in Surrey, the last record having been my own from Chertsey Meads in 1970; the day after he found it the spikes were mown off, but this should have no effect on the persistence of the plant. A few plants of garden rocket *Eruca vesicaria*, found by S. K. Bosher at Ham, are the first for the county since the publication of the previous flora of it in 1863. The September meeting of the SFC on Banstead Downs turned up two large bushes of the garden hybrid *Viburnum lantana* × *rhytidophyllum* which had previously been found in the wild only in Kent. The October meeting went to Hutchinson's Bank and Chapel Bank at Addington and found that *Rhinanthus angustifolius* had spread to the former too; the eyebright mentioned from the latter was *Euphrasia nemorosa* × *pseudokerneri*, which seems to have replaced the second parent species in every Surrey population critically examined. Orange foxtail *Alopecurus aequalis* is seldom seen in the Surrey part of our area, except at Runnymede where it is fairly constant; J. B. S. Hodge and S. K. Bosher are reported as having found it in Richmond Park. The conservation report includes favourable comments on Banstead Golf Club, which had found a colony of early purple orchid *Orchis mascula* and single green-veined orchid *O. morio*, and saved plant of juniper *Juniperus communis* from being overwhelmed by scrub.

Our own members have produced records from London boroughs in v. c. 17 and from further out in the area. The most surprising of our urban records is P. C. Holland's shepherd's needle *Scandix pecten-veneris* as a street weed in Clapham, an unlikely bird-seed alien. Another street was the source of his specimen of the annual ornamental grass hare's-tail *Lagurus ovatus*. P. S. Guest found a surprising stray pyramidal orchid *Anacamptis pyramidalis* in the north part of Wimbledon Common, and in the south part two colonies of common spotted-orchid *Dactylorhiza fuchsii* which he says may have been misidentified by others. Dr M. C. Sheahan found Johnson-grass *Sorghum halepense* as a street weed in Barnes and confirmed the presence of brown sedge *Carex disticha* in Richmond Park. At our meeting on 15 May honey garlic *Nectaroscordum siculum* was observed on Barnes Common. From Wandsworth Common, Mrs E. Norman reports most convincing five-foot tussocks of the rarer subsp. *arundinacea* of purple moor-grass *Molinia caerulea*, confirmed by P. J. O. Trist; this has not been reported previously from the London Area. Not a 1994 record, but Mr Archer pointed out to me that my account of *Oenanthe pimpinelloides* in the London Area last year (Burton 1994*a*) omitted to mention its large population in the lawns of a block of Southwark Council flats, discovered by B. Nicholson in about 1985 and previously reported in print by himself and others (Archer et al. 1989).

In Surrey outside London, our meeting on 1 October was timed to appreciate at their best the *Cotoneaster* species established at Howell Hill Nature Reserve, East Ewell. These have been mentioned here before, but it is worth singling out now purple-flowered cotoneaster *C. atropurpureus* which is easily mistaken for the more familiar wall cotoneaster *C. horizontalis*. On this occasion K. W. Page told me that Mrs Smith, Mrs J. F. Leslie and himself had rediscovered in an adjoining field the population of night-flowering catchfly *Silene noctiflora* reported as growing in thousands by Dr J. I. Byatt in 1979.

V.C. 18–19, Essex

Although Essex has a field club which started publishing *Transactions* over a century ago, the latest *Flora* of the county (Jermyn 1974) was published by the county Naturalists'

Trust. The *Flora* was published after the author's sudden death in 1973, having been completed by his widow and K. J. Adams who succeeded him as BSBI recorder for the two vice-counties. Dr Adams is also currently president of the Essex Field Club and has told me that the Club is proposing to undertake a botanical survey of the whole area, producing dot-maps on a one-km^2 scale. This is not quite such a formidable undertaking as it might seem at first because about a third of it, the part of the county furthest from London, has already been done as a separate undertaking by the Colchester Natural History Society (Tarpey and Heath 1990). Dr Adams, like Mrs Smith, is well aware of the link between natural history recording and nature conservation, and works in close co-operation with English Nature in south-west Essex. Among conservation activities in the Essex part of our area which have borne fruit in 1994, it is appropriate to mention the result of scraping away the peat layer from a relict patch of sandy heathland on Hainault Forest in October 1993. This has resulted in the appearance of a large patch of lousewort *Pedicularis sylvatica* and numerous seedlings of petty whin *Genista anglica*, the former having never previously been recorded from this site. A more extensive scrape on Long Running in Epping Forest in 1992 resulted in the immediate regeneration of heather *Calluna vulgaris* from seed, together with large numbers of two sedges rare in south-east England, *Carex binervis* and *C. viridula*, followed in 1994 by the first seedlings of cross-leaved heath *Erica tetralix*. Dr J. R. Dagley, who organized both scrapes, and who has now moved over from English Nature to become ecologist for the Conservators of Epping Forest, also reports two further sedge species from our area, *C. echinata* from Jacks Hill, Epping Forest and a large colony of *Carex strigosa* from Spratt's Hedgerow Wood by Cobbins Brook near Epping Upland. Also in Epping Forest, A. C. Wheeler discovered flat-stalked pondweed *Potamogeton friesii* in the Hollow Ponds at Whipps Cross and Dr A. Samuels rediscovered a large colony of cotton-grass *Eriophorum angustifolium* in Lodge Road Bog. She also found new colonies of soft shield-fern *Polystichum setiferum* along the Ching Brook near Ludgate Plain where it is probably native, and in Knighton Wood where it is probably introduced.

Dr Adams's wife Mrs J.M. Adams, also an active botanist, discovered *Saxifraga tridactylites* on an old wall at the rear of Loughton Hall, a useful find as it no longer occurs in the published locality on the wall at the rear of the King's Head at Chigwell about a mile away. The bean broomrape *Orobanche crenata* reappeared on Cranham Marsh after an absence of twelve years, bringing to forty-four years its intermittent presence in the Upminster area, the only place in Britain where it is known to have become established (Rumsey and Jury 1991). An Essex Field Club meeting to the chalk at Purfleet in May, to look at the possible effects of the Channel Tunnel rail link, resulted in 152 species being found in a single square kilometre, including deadly nightshade *Atropa belladonna*, wild liquorice *Astragalus glycyphyllos* and tuberous comfrey *Symphytum tuberosum* from the southern margin of Beacon Hill Pit, the *Astragalus* supporting a large colony of common broomrape *Orobanche minor*. Round-leaved cranesbill *Geranium rotundifolium* was found both in a hedgebank on the southern slope of the hill and on the same day across the Mar Dyke in the next square west. Also on the Essex chalk, R.G. Payne recorded a single man orchid *Aceras anthropophorum* just west of Mill Wood Pit, South Stifford. The only other man orchid sites in Essex are in Grays Chalk Pit and Chalk Farm Pit. The main Grays colony was destroyed by a housing development some years ago and the Chalk Farm Pit was filled in recently as part of the Chafford Hundred development, so this is a welcome addition to the small surviving relict colonies of chalk-loving plants around Grays.

All the above Essex records were supplied to me by Dr. Adams. Otherwise we have very few 1994 records from the Essex part of our area. George Hounsome found a patch of smooth brome *Bromus racemosus* on a roadside on Epping Forest. Part of our meeting on 19 June was Fishers Green in v.c.19 and saw the orchids *Anacamptis pyramidalis*, *Ophrys apifera* and single *Orchis morio* already known from this locality, as well as aliens *Papaver orientale* which David Bevan has suggested could have been a contaminant in a 'wild flower' seed mixture, and *Euphorbia oblongata*, an ornamental spurge which has also recently turned up as an established garden escape in Surrey and Hampshire.

V. C. 20, Herts.

Hertfordshire has the benefit of an Environmental Records Centre supported by the county council, from which the BSBI recorder for the county, T. J. James, is managing a flora survey which started in 1987. He issues an annual newsletter which shows how the survey is progressing, lists the most outstanding recent records, and discusses problems in identification and nomenclature which his contributors may have been experiencing. Hertfordshire Flora Survey *Newsletter* No. 7, dated March 1995, shows good coverage from about half the tetrads in the county, but from a few only thin or even no coverage. In our area, which accounts for about a third of the county, most of the poorly-covered tetrads are in the St. Albans area. Records of 1994 rarities in the *Newsletter* include tawny sedge *Carex hostiana* at Foulwells, its only known locality in the area, where it had previously been seen only in 1981, dog violet *Viola canina* at Panshanger at the edge of our area, and adder's-tongue *Ophioglossum vulgatum* in thousands on Kings Meads.

This was not seen at our meeting on the Meads on 3 July, although an excellent assemblage of plants was seen on that occasion, including aquatics, calcicoles such as clustered bellflower *Campanula glomerata* and small scabious *Scabiosa columbaria* on the bank above Chadwell Spring, and, rather more unexpectedly, a large population of annual knawel *Scleranthus annuus* in the heavily-grazed centre of a meadow. Our meeting on 19 June spent some time in a well-worked part of Herts. around Cheshunt as well as in Essex, fishing *Potamogeton friesii* out of one of the many flooded gravel-pits which characterize this part of the Lea Valley.

Ann Boucher, who has contributed as many records to the Herts. flora survey as anybody, is also a member of the LNHS and dutifully writes out details of her more interesting records for me, numbering well over a hundred a year. She mentions a different rare pondweed from a Cheshunt gravel-pit, *Potamogeton trichoides*, among the 1994 records. Early in the year Mrs Boucher sent me a specimen of a naturalized bulbous plant found by herself and C. G. Hanson occurring in thousands in derelict gardens at Ware, which proved to be *Scilla bithynica* which occurs similarly at Warley Place in Essex. Mr Hanson and she also joined forces to explore the grounds of Bayfordbury Park, which has previously been occupied by the John Innes Institute of Horticultural Research, and has many unusual naturalized plants, including the squirting cucumber *Ecballium elaterium* which had persisted for some years, birthwort *Aristolochia clematitis*, red-berried elder *Sambucus racemosa* and *Solanum stoloniferum*, the last a new name to me. I have also received a couple of Herts. records from Mr Hounsome, several from the Totteridge area from Dr Diana Griffith and a larger number from the extreme southwest of the county from P. J. Ellison.

V.C. 21, Middlesex

Middlesex is the only vice-county entirely within the London Area as we define it. The BSBI's recorder for the vice-county has always been D. H. Kent, whose own flora was published in 1975. He is currently preparing a supplement. Just as his work used the survey for our publication (Burton 1983) as a source of data, so he now passes to me for these papers records worthy of mention in print. In 1994 these have included a large population of marsh arrow-grass *Triglochin palustre* and two plants of *Anacamptis* near Walton Bridge in a meadow at Shepperton found by Barry Phillips, yellow figwort *Scrophularia vernalis* refound at its Staines site (Burton 1982: 106) by Sue Zmarzty and corn-cockle *Agrostemma githago*, one plant of which he and Mrs E. Wiltshire found in one of the wilder parts of Holland Park. Usually where this occurs in such places there is some evidence of the plant having been sown as 'wild-flower seed' but here there was not.

Members already mentioned under other vice-counties also contributed Middlesex records. I found water chickweed *Myosoton aquaticum* as an unlikely weed in a flower-bed in Gough Square in the City. Mr Kitchener found a quantity of hairy finger-grass *Digitaria sanguinalis*, a knee-high fig *Ficus carica* and ribbon fern *Pteris cretica* in streets of WC1. Mrs Norman found ribbon-weed in the stretch of the Lea Navigation north of

Tottenham, which I believe extends its known range here southwards. Mr Bevan mentioned two alien plants he had known since 1991, but had not reported before, in the case of the bird-sown loquat *Eriobotrya japonica* at his Railway Fields Nature Reserve because it had had to wait to be identified, in the case of *Fatsia japonica* by a stream in Queen's Wood because he was persuaded that it might not be merely planted by a recent reference to it as a garden escape elsewhere (Clement and Foster 1994). He also pointed out to me that I had apparently lost the 1993 records he supplied me; I shall make amends by quoting now his Austrian yellow-cress *Rorippa austriaca* by a footpath near Bulls Cross and Atlas poppy *Papaver atlanticum* well established on a wall-top at the Bruce Castle Museum, Tottenham, as well as more significant native plants in Haringey woodlands: pale sedge *Carex pallescens* and bristle club-rush *Isolepis setacea* in Coldfall Wood, sanicle *Sanicula europaea* and *Isolepis setacea* in Queen's Wood. Mrs Boucher reported spear-leaved willow-herb *Epilobium lanceolatum* near Cockfosters Station and alexanders *Smyrnium olusatrum* by Stagg Hill further up the A111. Mr Hounsome made three remarkable records by north London streets: Dallis grass *Paspalum dilatatum*, which is a common alien on grassy roadsides in southern Europe (and also in the United States, which is why it has a vernacular English name) but hardly known in this country, at the foot of a lamp-post in Bounds Green, pale galingale *Cyperus eragrostis* by a front gate in Southgate and field mouse-ear *Cerastium arvense* near Bowes Road west of Enfield, hardly a natural habitat for it. By a stream in Whitewebbs Park he came across rather obviously introduced intermediate polypody *Polypodium interjectum*, which cast doubt on the status of the more natural-looking hard fern *Blechnum spicant*. The grass mentioned was determined by R. M. Payne, whereas the *Sorghum halepense* found ten years ago at Northolt by Mr Ellison was only recently determined by E. J. Clement. (There seems to be no shortage of experts on hand to identify alien grasses. I named J. M. W. Topp's cockspur *Echinochloa crus-galli* from St George's Square, Pimlico and J. E. D. Milner's *Digitaria sanguinalis* from a street in Crouch End, whereas the tropical finger-grass *D. ciliaris*, of much less common occurrence, but found by J. Blackwood in a Chiswick school flower-bed, was named at Kew by T. A. Cope. One could fill a page of this journal with references to papers arguing whether or not these two are distinct species.)

A better-known population of hard fern was present at the edge of Harrow Weald Common until 1990 when it suddenly disappeared. In 1994 Howard Matthews found two small plants of it beneath where it had been, and this and other ferns discovered by him were pointed out at our meeting on 23 October. On this occasion a plant of *Cyclamen hederifolium* was also seen on the Common, in this case an obvious garden escape. Our 5 July meeting in Hyde Park and Kensington Gardens should also be mentioned. As well as many of the species referred to in Mrs Wiltshire's recent (1994) paper, including perennial rocket *Sisymbrium strictissimum* recently discovered by B. S. Wurzell, she also led us past a casual plant of celery *Apium graveolens*.

L. R. Williams's compilation of records from the Welsh Harp Reservoir appears elsewhere in this issue. A. H. Vaughan has pointed out that cyperus sedge *Carex pseudocyperus*, hemlock water-dropwort *Oenanthe crocata* and purple loosestrife *Lythrum salicaria* are not recorded from this area either by Kent (1975) or by Burton (1983), and that sea club-rush *Bolboschoenus maritimus* has greatly increased in area there, indications that conditions at the water's edge are different form what they were twenty years ago. Mr Vaughan's records also include many from Hampstead Garden Suburb, of which I will single out purple clematis *Clematis viticella* among native vegetation by the Mutton Brook.

Miss D. Willment reported large bitter-cress *Cardamine amara* from the ditch bounding Syon Park near her home, and with P. A. Harmes, a visitor from Sussex, found a bay tree *Laurus nobilis* and common ramping-fumitory *Fumaria muralis* (which is far from common) on Hounslow Heath, and three-cornered garlic *Allium triquetrum* in a spinney at Feltham. Finally two members new to this part of *The London Naturalist* should be mentioned: over five years S. J. Tobin has compiled long lists from localities in the northern part of the borough of Harrow, recovering almost all of the well-known rarities in this part of London, and in 1994 finding Mexican poppy *Argemone mexicana* on Stanmore Common, a casual not reported in our area since 1939, and Miss B. J. Villiers showed me a photograph of buck's-beard *Aruncus dioicus* from Queen's Wood.

V. C. 24, Bucks.

Only a small part of our area is in this vice-county, and it is many years since we last conducted a botanical excursion to it. The BSBI recorder, R. Maycock, would welcome contributions to a tetrad survey of the flora of the vice-county from our members. The only 1994 record of note from this part of our area to have reached me is Mrs C. D. Hawkins's alexanders *Smyrnium olusatrum*, of which I have seen a photograph. However a 1990 record of small-flowered buttercup *Ranunculus parviflorus* in the Old Slade Nature Reserve near Iver has reached me by a roundabout route, and indicates that this is part of the London Area deserving more attention than we give it.

Conclusion

The BSBI's system of vice-county recorders has the advantage that it provides total coverage of the country, using permanent boundaries, though in places these can be very difficult to follow (Burton 1994*b*). In the London Area, only the recorder for Kent chooses to ignore the Watsonian boundary, not collecting records from that part of v. c. 16 which is now in London boroughs. The vice-county of Middlesex is entirely within London boroughs except for its south-western part which is now the Spelthorne district of Surrey. I do not think it is possible to escape the conclusion that if at any time the London Natural History Society should participate in the setting-up of a Biological Records Centre for London, that would be the time to reduce our recording area from its present circle to the outer boundary of the London boroughs, with the possible addition of Spelthorne. This would enable to us to abandon any pretence of coverage of such areas as the small part of Bucks. mentioned and those tetrads in rural Essex less than twenty miles from London where we failed to record any breeding birds at all (Montier 1977).

This need not leave the London Natural History Society totally without a role in a wider London area. In the field of botanical recording, we could still co-ordinate ventures where inter-society co-operation around London is appropriate. These might include projects recording the current distribution of species which appear to be spreading radially from an urban centre, or at least appearing more commonly than one would think from a reading of our *Flora* (Burton 1983). *Conyza sumatrensis*, the subject of a separate paper in this issue of *The London Naturalist* (Burton 1995), is just such a species, and others worth considering for the same treatment are *Ammi majus, Artemisia verlotiorum, Bidens connata, Cardamine hirsuta, Cochlearia danica, Crassula helmsii, Digitaria sanguinalis, Galinsoga ciliata, Geranium rotundifolium, Heracleum mantegazzianum, Hirschfeldia incana, Hyacinthoides hispanica, Hyacinthoides hispanica* × *nonscripta, Lagarosiphon major; Lemna minuta, Leycesteria formosa, Myriophyllum aquaticum, Picris echioides, Picris hieracioides* and *Vulpia myuros*.

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Book review

The New Naturalists. Peter Marren. HarperCollins 'New Naturalist' library. No. 82. London. 1995. 304 pp., numerous illustrations. £30 (hardback with illustrated wrapper). ISBN 000 219998 X: £14.99 (softback). ISBN 000 219997 1.

The 'New Naturalist' library has reached its fiftieth publishing year. The title of this latest book is a pun on the books and their authors. Their post-war task was to reinterpret ecological biology and related topics. and to convey their approach in a readable way to a wide spectrum of readers. Some failed miserably. and their books were applauded. but in practice secretly little read: others. happily by far the majority. achieved these ends magnificently. The series thus became a great achievement. not just for W.A. Collins Ltd and the early editors (James Fisher. Julian Huxley. Dudley Stamp. Eric Hosking. John Gilmour). but collectively for its authors and for the British post-war natural history movement as well.

Anyone who is inspired by natural history in Britain will have been impressed by one or other of the 104 titles (including twenty-two Monographs). In this respect the achievement of the series is not unique: pre-and post-war. Frederick Warne's 'Wayside and Woodland Series' and 'Observer's Books'. the Linnean Society's *Synopses of the British Fauna* (now at 50 titles) and Collins's own 'Field Guide' series. still going strong. might all claim the same. and there are other societies and institutions which have had a long-term commitment to similar series. So too might have claimed the London publishers Benjamin White and Van Voorst from the two centuries preceding our own: and still might The Ray Society. which has outlasted them all. having been publishing natural history books since its inception in 1844.

But the unique aspect of the 'New Naturalist' library. that justifies this seemingly introspective book. is that its titles have *interpreted* their subject *for the lay reader* rather than. as these other series have mostly done. presented at one level or another encyclopaedic reviews of the taxa covered. When the series was started. it was a bold financial venture: would there be adequate market for expensive books on esoteric subjects in austere post-war Britain? The outcome is common knowledge. but Peter Marren's book is the first account of it.

He handles the subject with great skill. For me this was an intrinsically interesting. almost a single-sitting. book. like *Dragonflies*. the first volume of *The open sea* and. had it been shorter. *Sea-birds*. with all of which it ranks in readability: and in scholarship it ranks with the best too. But more than that. Judged apart from the series. it is also quite outstanding in the fields of natural history biography and bibliography ('B&B'). Unusually for a book of this scope. it has been written while many of the authors are still alive. or at least remembered first-hand. Documentary evidence. memoranda. invoices and like. are still reasonably plentiful. Marren profited greatly from seeing some of Collins' office files. The publishers are to be applauded both for allowing him this and for realizing their very entitlement to encourage and promote this professional look at their own achievement. For not only is the series unique in natural history: the book is unique also in the B&B of that subject.

There are criticisms. The late E.B. Ford. a man of rare talent. but also of rare social and academic opportunity and position. gets twenty-six pages. a whole chapter. This was partly because his MS (*Butterflies*. 1945) was ready before others commissioned at or nearly at the same time. so his book became number 1: but also because he was a well-documented person and hence sensible to choose as an example of how the early titles came about. Ford also wrote *Moths* (1955). but in contrast. the LNHS's own Eric Simms. who wrote a joint-record four titles for the series from his home and who would still presumably have been available for interview by the author. gets little more than nine lines. (L. Dudley Stamp was the other who wrote four titles.) This is a pity because future generations might well like to know more about such essentially amateur high achievers: would we not today about the legendary Victorian vicar and his true role in the natural history movement? But this highlights Marren's dilemma: since most authors in the series have been high achievers. and would warrant biographies themselves. what should be left out?

The book is exceptionally well illustrated. with photographs of many of the authors and also by colour reproductions of many of the famous wrappers and trial runs and mock-ups of some never used. The section on the wrappers. most of which were due to the hard work of professional designers Clifford and Rosemary Ellis. is wonderfully enlightening: who among us has not marvelled at them? They belong to art itself rather than to publication. The innovative and colourful wrapper on the hardback version of the present book. conceived by Robert Gillmor. who has done them in recent years. is worthy of both title and series. It seems a waste not to use it on the softback too: but this is the convention. and the softback does carry its own excellent and artistic photographic still-life study. apparently unattributed.

The book ends with lists of titles, dates, editions, print-runs, and potted biographies of authors. However, the LNHS's R.C. Homes, the other members of the committee he chaired, plus the individual authors *per se* of the Society's book, *Birds of the London area since 1900*, are, unfortunately, omitted from the biographies. Thoroughly fascinating is an account of the collecting cult that the series has inspired, indicating which among them are the more collectable. Aspects of this section too will delight some future historians.

Finally, and perhaps slightly out of place in a review, we should briefly recall the substantial role of the LNHS in the series. In fifty years the LNHS has been its only corporate author (*Birds of the London area since 1900*, 1957), no other society having generated a title. Also, surely uniquely nearly twenty of our members have been authors, with in most cases undoubted mutual gain for both the NN series and the LNHS. All their books have been seminal. In addition, two to the original five-editor team, chief editor James Fisher and photographic editor Eric Hosking, were LNHS members Fisher for thirty-three years and Hosking for forty-one. Almost certainly, some part of their foresighted early view of post-war natural history came from their contacts with the LNHS.

'New Naturalist' authors who have been members of the LNHS

Author	**Date** (1st ed.)	**Title**	**Series No.** M=Monograph	**Date joined LNHS** Other comments
Brian Vesey-Fitzgerald	1946	*British game*	2	1938
Richard Fitter	1945	*London's natural history*	3 (*sic*)	1934 Hon. Vice-President
Bruce Campbell and others	1949	*Snowdonia*	13	1967 Hon. Vice-President
J.E. (Ted) Lousley	1950	*Wild flowers of chalk and limestone*	16	1936 President, Vice-President
E.M. (Max) Nicholson	1951	*Birds and men*	17	1934 Hon. Vice-President
Malcolm A. Smith	1951	*The British amphibians and reptiles*	20	1937
James Fisher	1952	*The fulmar*	M6	1937
James Fisher (with R.M. Lockley)	1954	*Sea-birds*	28	As above
R.C. (Dick) Homes and others	1957	*The birds of the London area since 1900*	M14	1932 President, Hon. V-P
Guy Mountfort	1957	*The hawfinch*	M15	1937
Cynthia Longfield and others	1960	*Dragonflies*	41	1926 President, Hon. V-P
M.E. (Peggy) Brown (with W.E. Frost)	1967	*The trout*	M21	1948
Eric Simms	1971	*Woodland birds*	52	1949
Peter Yeo (with Michael Proctor)	1973	*The pollination of flowers*	54	1949
Christopher Perrins	1979	*British tits*	62	*c.* 1956
Eric Simms	1978	*British thrushes*	63	As above
Eric Simms	1985	*British warblers*	71	As above
Eric Simms	1992	*British larks, pipits and wagtails*	78	As above

PAUL CORNELI

Book Review

Megabugs: The Natural History Museum book of insects (official book accompanying the MEGABUGS exhibition). 1995. Miranda MacQuitty, with Laurence Mound (scientific adviser). The natural History Museum / River Swift, London. 128pp. £12.99 ISBN 1 898304 13 0.

If ever there was a book to get the reader interested in insects then this is it. Young or old, scientist or layperson, it would be a churlish reader who was not excited by both the wonderful colour photographs and concise celebratory text. The diversity of scientific information about insects is excellent; the anecdotes and bizarre facts go from the frightening to the hilarious.

As it was published to accompany an exhibition for children and young people at The Natural History Museum, the book's primary audience is a young one, but it clearly has much wider interest. However to get an idea of its impact on the younger readership, I consumer-tested it on two informants aged ten and seven — a neighbour and my daughter. Both were highly enthusiastic, ('the best book on insects we have ever seen') and they agreed that the pictures were 'amazing'; the favourite being the truly remarkable massing of coccinellids (ladybirds) filling page 8 and then for good measure repeated in a slightly different form on page 41. Adults may be less extravagant in their appreciation, but as an entomologist I could not disagree with my young friends; for the record, my own favourite is the portrait of a *Dytiscus* beetle with shimmering reflection that would be a recurring nightmare if I were a tadpole.

Good science can also be fun, though I'm afraid not all entomologists have as good a sense of humour as Miranda MacQuitty who seems to have collected amusing anecdotes to illustrate nearly every aspect of insect behaviour and ecology. She relates the 'sad fate' of a china-mark moth which evaded a predatory Daubenton's bat by suddenly dropping like a stone, only to land on the surface of a stream where it was eaten by a trout! So adult moths can be part of both the terrestrial and aquatic food-chains.

Every aspect of insect behaviour is explored from strange feeding (one hawk-moth has a tongue that is 10 inches long) to extraordinary mating (male springtails leave packets of sperm around for the females to pick up; in several species the female eat a good meal while in the act) and amazing numbers (a locust swarm was once estimated to contain around 40m billion individuals). Much of the text explains the myriad ways in which insects affect our lives from the transmission of disease to the pollination of our crops.

As Dr MacQuitty describes and explains the diversity of insect form and function, it becomes clear that one of the things that fascinates her most is rather unexpected; the insect world as human food. Although I could not find her giving personal testimony in this unlikely area, it is a subject whose study at least she obviously revels in, digging out bizarre and extraordinary facts. For example I have visited Lake Victoria more than once, but have never come across the local people she refers to who collect millions of tiny midges and bake them into kungu cake. Disappointingly she does not attempt to describe the taste, aroma or even the nutritional value of kungu cake.

Personally I have never been able to eat insects in spite of once spending a week living with people in the Amazon whose favourite snack was boiled caterpillar. So I admit I was surprised to learn (under a photograph of a sticky lollipop containing a large mealworm) that in America eating insects is something of a craze with a regular newsletter about new insect dishes, poisonous insects and so on, now being circulated from the University of Wisconsin (Department of Entomophagy presumably.

Finally one small criticism made by my two young informants (with which I could only agree). As they told me, the weakest part of the book is the jacket; in our collective view almost any picture from within the book would have been better than the one chosen for the front cover! But *don't* let that put you off.

J. Edward Milner

Book review

Bird-watching in London — a historical perspective. E.M. Nicholson. London Natural History Society. 1995. xiv, 203 pp. £8.95. ISBN 0 901009 05 9.

I was delighted to be invited to review *Bird-watching in London* because I have long been an ardent admirer of Max Nicholson. He was defending wildlife and wildlife habitats long before the rest of the world had woken up to realize there was a problem and that we were losing valuable habitats and species. Although at one time a civil servant he still, unusually, spoke his mind, and as Director-General of the former Nature Conservancy made great strides both in making people aware of the need to conserve wildlife and in actually doing something about it.

Most of what is in this book was written in the mid 1920s with the preface completed on 1 January 1927 when he was 23 years old. At that time he was unable to find a publisher as those he approached all felt there was no market for such essays on birds. The manuscript was then relegated to a bottom drawer to be retrieved seventy years later and passed to the London Natural History Society: it appears now as *Bird-watching in London – a historical perspective.* The book includes his original, unaltered and very readable essays on London ducks and London gulls, on flylines — the flightpaths of birds over London, researched by him and his brother, on a report of the censuses he carried out one winter in Kensington Gardens and Hyde Park, and a list with notes of the birds that he observed in the parks. Censuses are commonplace nowadays with the BTO's Common Birds Census, the new Breeding Bird Survey and Waterways Bird Survey and so on, but at the time Max Nicholson carried out his winter censuses in 1923/26, this was innovative work; few people had previously attempted to estimate the numbers of birds in any locality. There is a chapter too on bird protection written by him in the 1920s, and then an updated account of census work since the 1920s with some interesting comparisons between years. Where have all the house sparrows and starlings gone? Reductions in the wider countryside are blamed on agricultural intensification and the widespread use of agricultural pesticides, but this cannot be the reason for the declines in the city parks. Is it cats, pesticides or traffic, as the BTO are now suggesting?

Max's observations of the behaviour of ducks in the parks, of gulls and flightlines taken by birds over London are entertaining, but are not new. What I found more interesting were his views on carrion crows. For example, he writes 'We outlaw him (the crow) falsely on high moral grounds as a villain'. These views were very much contrary to the prevailing attitudes of the day when all crows (and most birds of prey) were intensely persecuted, supposedly to protect other birds. Max Nicholson strongly defends crows and in six pages champions their right to survive, preying on eggs and young of other birds. He understood that such predation does not necessarily impact on populations. At the present time when there is so much misconception about the impact of magpies on songbirds and the impact of goosanders on fish, it is refreshing to read Max's treatise on the subject. I have a sneaking admiration for corvids, having as a child kept a tame rook, and later a tame crow, and sympathize with Max's well-expressed arguments. He put forward three reasons to demonstrate 'the falseness of reasoning by which slaughter of the London crows is justified'. He accepts that crows take ducklings, but stresses that we shouldn't assume that if crows were killed, the number of ducklings otherwise eaten would be saved. Other factors such as hard weather and disease might kill them. He pointed out that it was wrong to assume that the crows' victims would be additional to losses from other natural causes. 'You do not abolish death simply by abolishing one of its minor causes which happens to strike your purblind eye — you only alter the manner of it.'

Max believed too that the Royal Parks should not be treated as glorified duck farms with the more ducks the better. He concludes that 'because we see it (crows preying on ducklings) happen openly, we are persuaded to exaggerate its frequency to an altogether ridiculous extent. The fierce spectacular predatory creature snatches for himself no more than stray fragments of the colossal stream of quickly consumed life which is perpetually being emptied into oblivion.'

His essay on bird protection includes strong criticism of the 'Victorian cemetery-flora' — laurels and evergreens — at that time planted so widely. He advocated weeding out of alien evergreens and their replacement with indigenous species such as hawthorn, blackthorn, gorse and plenty of fruit trees. When discussing the great wildlife potential at Queen Mary Reservoir, formerly Littleton Reservoir, he bemoaned the fact that the bank planting was in the hands of the Royal Horticultural Society which had at Staines Reservoir planted a 'dreary wall of laurels and exotic evergreens'. This certainly struck a chord with me. Incidentally, his bird list for Queen Mary Reservoir makes interesting reading. Amongst the many species that he observed there just before the reservoir opened and during the early stages of it filling with water, were cirl bunting and nesting red-backed shrike. He also in this bird protection chapter pointed out, in his inimitable way, the hypocrisy of those who point an accusing finger at magpies or crows, but at the same time themselves keep cats: 'to encourage birds in a garden with food and nestboxes, and to keep a pet cat which takes advantage of their confidence to slay them is one of those pieces of unconsciously refined cruelty which the kind of people who want to exterminate hawks and crows are constantly committing'.

In November 1975, exactly 50 years on from his first winter census, Max, together with Sir Con O'Neill, Roy Sanderson and P. Ball, repeated the count. A comparison between the two censuses provides material for a further chapter in which data from additional censuses carried out by Stanley Cramp and W.G. Teagle in 1948 and by Roy Sanderson in 1966 are also included. Overall, bird numbers had declined during the 50 years from a total of 3,982 birds to just 2,319. However, the number of species had increased from 29 to 43. In 1975 house sparrows were still the most numerous species though only 544 were counted compared with 2,603 in 1925. The next commonest species in 1975 were woodpigeon, black-headed gull and mallard. The species showing the most outstanding increases were blackbird and tufted duck.

A new chapter by Roy Sanderson provides a very useful systematic list of the birds of these parks and summarizes the historical and current status of all recorded species. There have been some marked changes over the years. As an infrequent visitor to London myself, I was interested to learn that rooks virtually disappeared as a breeding bird in Kensington Gardens in 1880 when some 700 trees were felled, although a few pairs nested in 1893 and three nests were seen in Hyde Park in 1900. Rooks last nested in London in 1916. Magpies were lost too in the nineteenth century, but attempted nesting in 1969 and 1970 and successfully reared young in 1971; this nest and one in Regent's Park were the first in inner London this century. Today there are some seven pairs in Kensington Gardens. There have of course been many other gains. For example, coal tits bred in Kensington Gardens in 1947 and regularly there since 1966; treecreepers first bred in the Gardens in 1945 with up to four pairs now regularly breeding. Long-tailed tits have bred in most years since 1972 and blackcaps since 1967. Formerly grey wagtails were recorded infrequently as a winter visitor and on passage — Max Nicholson only recorded one, at the Long Water, in three years of observation in the mid 1920s. Now they are a regular, but not numerous, winter visitor and passage migrant, with a pair breeding in 1976 and 1977 close to the Gardens and collecting food for nestlings within its bounds.

In summary, I found *Bird-watching in London* a fascinating book, both for the information it provided me on the changing fortunes of the city's birdlife, and for the insight it gave me into the character of the youthful grand old man of conservation, Max Nicholson. All London's birdwatchers and conservationists will surely want to have a copy.

STEPHANIE J. TYLER

Book review

Scarce plants in Britain. Compiled and edited by A.L. Stewart, D.A. Pearson and C.D. Preston. Joint Nature Conservation Committee, Peterborough. 1994. 508 pp. £34. ISBN 1 873701 66 7.

This admirable book is the result of a project jointly undertaken by the Botanical Society of the British Isles, the Joint Nature Conservation Committee, and the Institute of Terrestrial Ecology. The main aim was to map the distribution of nationally scarce species which are defined as those currently recorded from 16–100 10-km squares. These plants are less rare than those listed in the *Red Data Book* (2nd edition 1983) which are thought to occur in fifteen or fewer 10-km squares. They are, nevertheless, of considerable conservation importance and are, in some cases, actually more at risk than some classic rarities which may retain small, but reasonably stable, populations. There are accounts of 325 scarce species, although some of these are now known to be more widely distributed. Each account, which is written by an expert, includes a description of the plant's habitat, summarizes its reproductive biology, comments on any historic changes in its distribution, and assesses any current threats. The detailed maps include previous records culled from the *Atlas of the British flora* (1962), and thus show the distribution at different periods. It is a little unfortunate that these maps are slightly smaller than those in the *Atlas* and are thus incompatible with the excellent series of overlays for that work. In many cases significant changes are highlighted and the decline of some species is shown to be extensive and alarming. In particular, losses to lowland species of inland situations as a result of severe habitat destruction are clearly demonstrated. These include, as expected, a range of arable weeds such as shepherd's needle *Scandix pecten-veneris* and small-flowered catchfly *Silene gallica*, and such wetland species as greater water-parsnip *Sium latifolium* and pennyroyal *Mentha pulegium*. The last species is now known to be one of the most threatened plants in Britain. It is one of the nine species included in the current work that have been recorded from fifteen or fewer 10-km squares since 1980 and may thus qualify for inclusion in the next edition of the *Red Data Book*.

Following the species accounts is an excellent chapter on the major habitats of scarce plants in Britain. Ten such habitats are described and their associated species listed. Accompanying maps chart the changes in distribution of each group since 1970. As expected, species from chalk grassland, water margins and damp mud, arable land, and coastal habitats, have suffered the worst declines, whereas montane species, whose habitats are often remote, inhospitable, and unproductive, have suffered less from human exploitation. Some of the latter group, however, could well be affected in the future by the predicted climatic warming and the existing maps will be invaluable for monitoring such changes.

A useful concluding chapter discusses changes in our knowledge of the distribution of species from 1962–1992. It is pointed out that, although some species have actually shown an increase in records on the current maps, these are almost entirely due to increased recording effort which may sometimes mask an actual decline. Indeed, all too many scarce plants are shown to be declining. The index most helpfully includes paginated cross references to all species listed in the current *Red Data Book* (2nd edition 1983) and also those likely to be included in the third edition.

This is a very welcome and important publication which will form an invaluable database for plant conservation in Britain for many years to come.

David Bevan

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The London Naturalist

Instructions to contributors

Submission of papers

Papers should be submitted **in duplicate** to the editor, Mr K.H. Hyatt, at his home address, or c/o Department of Zoology, The Natural History Museum, Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. However, the editor may be contacted at any time to discuss possible contributions, and will be pleased to send a recent offprint to show our style, and as a guide to preparing the manuscript. Manuscripts should be typed on one side of the paper only and with double spacing and wide (3-cm) margins. Authors must retain a copy. Papers should include at the beginning an **abstract, summary** or **synopsis. Sheets must be numbered.** The editor would be pleased to receive contributions as ASCII files on disc (either 3½" or 5¼") in IBM-compatible format as well as in manuscript as above. Papers should be relevant to the natural history and archaeology of the London Area. This includes comparisons between London and its surrounding countryside with other localities, as well as work relating to or comparing species or habitats which occur in the London Area.

Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must being with lower-case initials, and **only** Latin names of genera and species must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. **Genus names should appear in full where first used within each paragraph.** When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 100 should be in words, except in a strictly numerical context. Dates in the text should follow the logical sequence of day, month, year, i.e.25 December 1971, but in lists as 25.xii.1971. Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs, or St. Lists should be in systematic, alphabetical or numerical order. **Hyphens should not appear at the ends of lines. Tables should be typed on separate sheets at the end of the text. Word-processed text should not use italic, bold or compressed typeface. Paragraphs should be indented.**

References

Reference citation should be based on the Madison rules (*Bull. Torrey bot. Club* **22**: 130–132 (1895)), except that a colon should always precede a page number. Capitalization in titles of books and papers in journals should be kept to a minimum. Journal titles should be in full or follow the abbreviations in the *World list of scientific periodicals* and be underlined. Book titles should also be underlined. Examples are as follows:

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Meadows (1970 : 80) or (Meadows 1970).

In references:

MEADOWS, B.S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964–9. *Lond. Nat.* **49**: 76–81.

MELLANBY, K. 1970. *Pesticides and pollution.* Ed.2. Collins, London.

WHITE, K.G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92**: 39–45.

Authors must ensure that all references are cited accurately: they will not be checked by the editor.

Illustrations

Distribution maps should be submitted in the form of a recording map with symbols in Indian ink and stencilled or by transfers, e.g. 'Letraset'. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. The caption should be written outside the frame of the map and will be set up by the printer.

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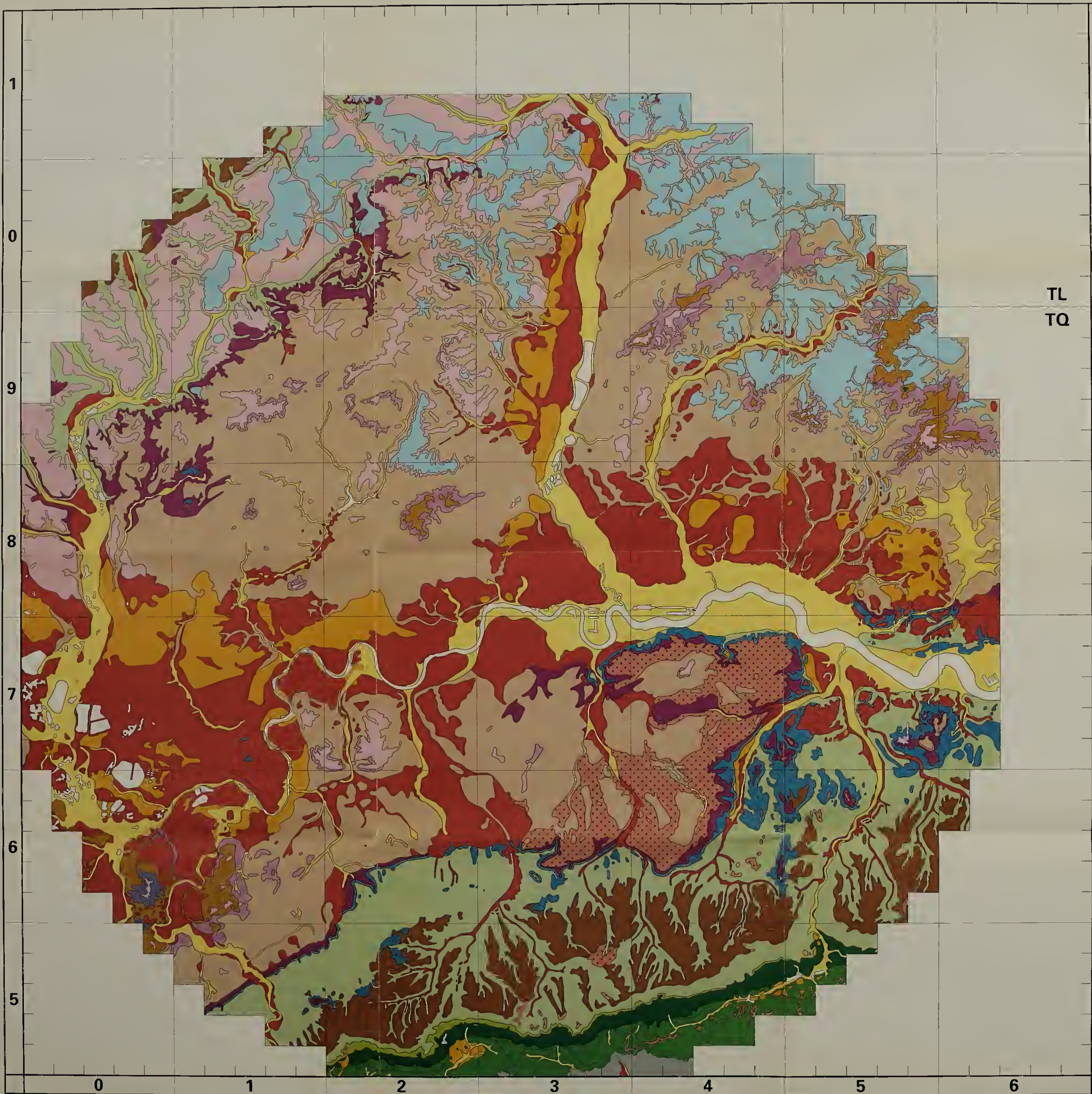
THE SURFACE GEOLOGY OF THE LONDON AREA

by

Colin W. Plant

London Natural History Society, 1994



THE SURFACE GEOLOGY OF THE LONDON AREA

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Areas left white are water bodies.

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Compiled and drawn by Colin W. Plant with assistance from Ken Hill.

Based upon the *Geological Survey of Great Britain (England and Wales)* map sheets as follows:

Sheet 238 Aylesbury, published 1946*; Sheet 239 Hertford, published 1948*; Sheet 240 Epping, published 1981; Sheet 255 Beaconsfield, published 1981; Sheet 256 North London, published 1951*; Sheet 257 Romford, published 1951*; Sheet 269 Windsor, published 1981; Sheet 270 South London, published 1921*; Sheet 271 Dartford, published 1924*; Sheet 285 Aldershot, published 1976; Sheet 286 Reigate, published 1978; Sheet 287 Sevenoaks, published 1971*, by the **British Geological Survey** and reproduced with the permission of the Copyright Manager.

Geological survey sheets indicated by '*' were published at 1:63,360 scale (1 inch = 1 mile); remaining sheets are published at 1:50,000 scale (2 cm = 1Km).

For Essex, minor modifications have been incorporated with reference to Adams, K.J. *The surface Geology of Vice-counties 18 and 19* in Jermyn, S.T. (1974 [1975]) *Flora of Essex*: Essex Naturalists' Trust.

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NOTES

1 Geological deposits of less than one metre in depth are not mapped. Patchy deposits of drift of lesser thickness, as well as artificially altered substrates are widespread and frequent across the area and influence soil type locally.

2 Boundaries of outcrops have been adjusted in a few places to fit data from adjoining sheets drawn at different scales or to accomodate partial revisions. Whilst every attempt has been made to be as accurate as possible,no liability can be accepted for errors in boundaries or the designation of rock types. Persons wishing to examine in detail the surface geology of specific local areas should always refer to the appropriate map sheet published by the British Geological Survey.

3 Current geological thinking combines the Claygate Beds of the Eocene with the London Clay. I have maintained the separation here, however, on the grounds that the resultant soil types above the beds may differ from those on the London Clay proper and thus may potentially affect the distributions of flora and fauna. A fuller explanation is given in the accompanying paper in *London Naturalist* **73**.

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